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WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

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GAS PURIFICATION
BY
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COWEN'S PATENT FIRE-CLAY RETORTS.
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Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
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TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
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THE
"OTTO" GAS-ENGINE.
See Page 498.

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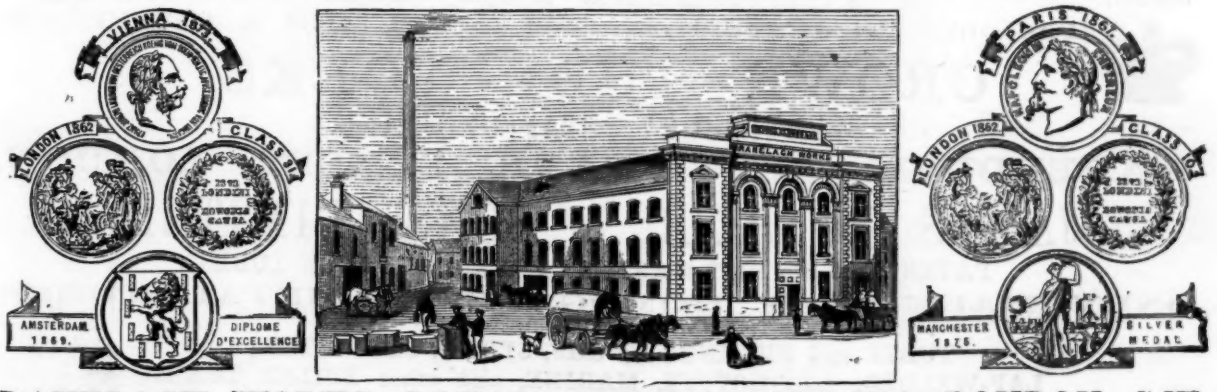
GEORGE GLOVER AND CO.,

DRY GAS-METER MANUFACTURERS,

HAVE REMOVED TO MORE EXTENSIVE PREMISES:



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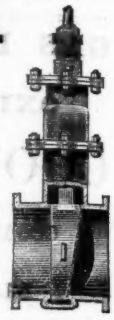
GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

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OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

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CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF

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SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & Sons undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

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Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

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Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists. It has the following qualifications and properties:—

EFFECTUALLY PREVENTS AND ARRESTS CORROSION. HAS A FINE GLOSS, AND IS VERY DURABLE. DOES NOT REQUIRE DRIERS LIKE OTHER PAINTS. PROTECTS IRON FROM ACTION OF WATER.

IS NOT AFFECTED BY SULPHURETTED HYDROGEN. FORMS A VERY HARD TOUGH (NOT BRITTLE) SURFACE. WILL NOT CRACK, BLISTER, OR SCALE. IS NOT AFFECTED BY EXTREMES OF TEMPERATURE.

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HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

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ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

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GAS APPARATUS;

CONTRACTORS FOR THE

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AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

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BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

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Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

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WELLS, BIRCH, RYDE, and CO., Limited,

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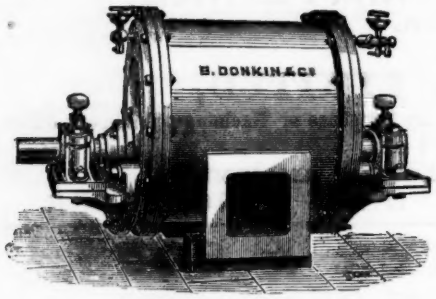
Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.



J. BEALE'S

NEW PATENT GAS-EXHAUSTERS,

For the Manufacture of which

MESSRS. B. DONKIN & Co.

POSSESS THE SOLE RIGHT.

Made with two Outside Bearings and with all the Latest Improvements.

FULL PARTICULARS ON APPLICATION.

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Messrs. B. D. & Co. are also Manufacturers of Steam-Engines and of Improved Gas and Water Valves, &c., &c.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

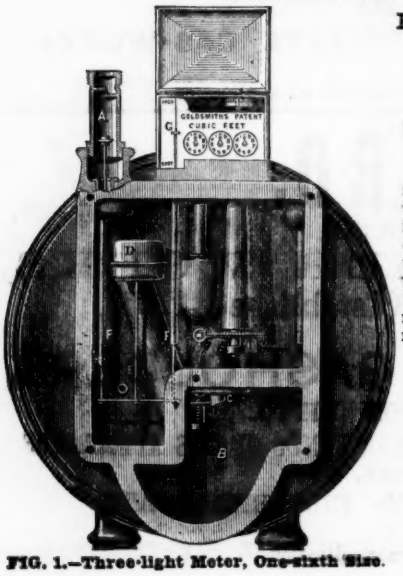


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

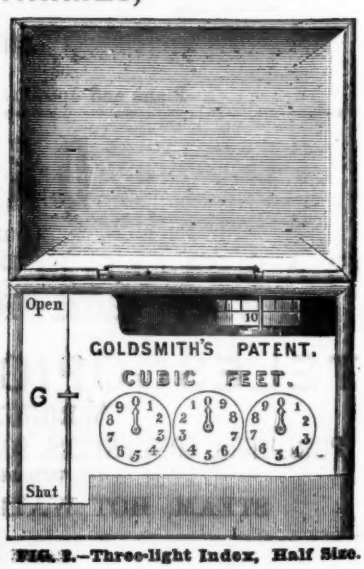
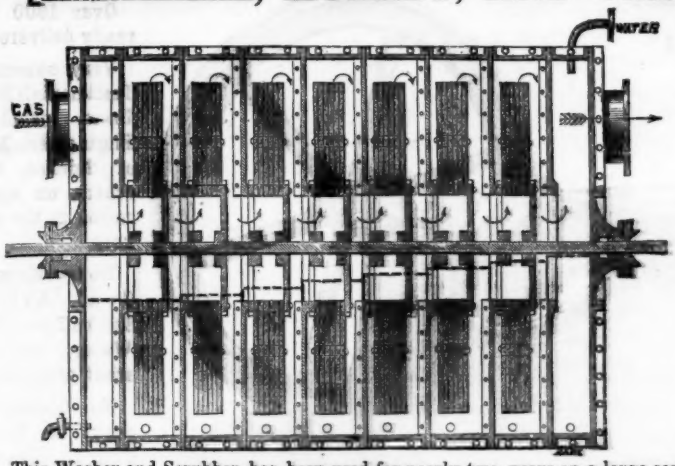
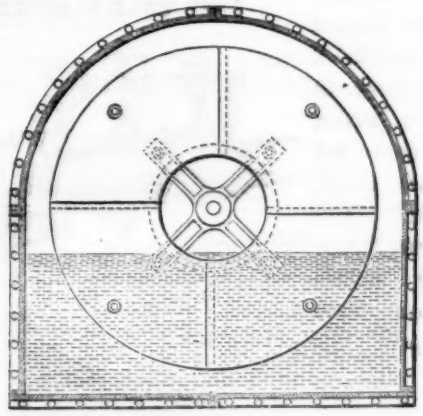


FIG. 2.—Three-light Index, Half Size.

THE "STANDARD" WASHER & SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]





This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

D. HULETT, Esq. *The Gaslight and Coke Company, Bromley-by-Bow, May 3, 1877.*

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Leeds Corporation Gas-Works, York Street, Leeds, Dec. 6, 1878.*

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber,** so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel.** The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c. (Signed) JOHN CLARK.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 1	8½	6¾	5	3½	2½	1½	⅜	¼	0	0	10 Gallons.	52,000	Nil.	77°	73°	46°	24	22	7½
„ 2	8¾	7	6	4½	3½	2½	1½	⅜	¼	0	10 „	57,000	Nil.	73°	66°	32°	21½	20½	4
„ 3	9½	8	6	3¾	3	2½	1½	⅜	¼	0	10 „	60,000	Nil.	75°	68°	40°	23½	22	4
„ 4	9½	7¾	6½	4½	3½	2½	1½	⅜	¼	0	10 „	65,000	Nil.	74°	68°	33°	24	23½	5
„ 5	9½	7	6	4	3	2½	1¼	1	¼	0	10 „	34,000	Nil.	77°	68°	35°	14½	14	5
„ 6	9½	7½	6½	4½	3	2½	1½	1	¼	0	10 „	63,000	Nil.	72°	66°	27°	24	23½	4½
„ 7	11	9	7	5½	3¾	3	1⅝	1½	¼	0	10 „	59,000	Nil.	74°	66°	31°	25	23½	5
„ 8	9½	7½	6	4½	3	2	1	¾	¼	0	10 „	78,000	Nil.	75°	61°	31°	28	26½	4½
9	11	9	7	5	3¾	2½	1½	1	¼	0	10 „	82,000	Nil.	74°	67°	33°	27½	25½	5
„ 10	10¾	8½	6¾	5	3½	2½	1½	1	¼	0	10 „	66,000	Nil.	76°	64°	28°	28½	27	5
„ 11	12½	10	7½	5½	4½	3½	1⅝	1¼	⅜	0	10 „	61,000	Nil.	75°	64°	27°	26½	24½	5
„ 12	11	8½	6¾	—	—	—	1¼	¾	⅜	0	10 „	39,000	Nil.	74°	64°	27°	26½	25½	5
„ 13	13	10½	8¼	6	4¾	3½	2	1½	½	0	10 „	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May 28, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March 6, 1879.*

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				—	—	—	—	—	—	—	—	—	—	
64,000 {	Inlet	2·00	2·00	158·8	72	57	21	} 4½ {	Twaddel deg. at 60°	5·3	4·9	2·85	2·25	1·7	1·05	0·6	0·8	0·12	0·1	} 63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces. . .	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·8	—	

WASHER-SCRUBBERS OF THIS PATENT ARE IN COURSE OF CONSTRUCTION FOR BECKTON, BRADFORD, GREENWICH, WOOLWICH, AND SEVERAL OTHER GAS-WORKS.

For further particulars and testimonials, address

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

PALMER & SON.

Over 1900 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877,)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. **SIZES** { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¼ 1½ 2½ 4 9 12 18 24 } **OFFERED.** CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

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THE NEW GAS COOKER.

40 PER CENT. OF GAS SAVED.

No. A510 same as our **No. A152,**
BUT LINED WITH PATENT NON-CONDUCTOR.
Will Roast, Bake, and Fry, and with Three Burners for Boiling.

SIZE.
Outside—30in. high, 20in. wide, 20in. deep.
Inside—19½in. „ 14in. „ 17in. „

Price . . . . . £4 14s. 6d.

No. A500.
LINED WITH PATENT NON-CONDUCTOR.
Is fitted with Roasting and Baking Oven and Four Burners for Boiling.

SIZE.
Outside—34in high, 20in. wide, 19in. deep.
Inside—30in. „ 16in. „ 17in. „
Hot Plate—24in. by 23in.

Price . . . . . £7 10s. 0d.

No. A505.
Same as with Roasting and Baking Oven, a Broiler or Toaster, a Chop Griller, a Hot Water Boiler, and Three Burners for Boiling.
Hot Plate—26in. by 24in.

Price . . . . . £9 15s. 0d.

These Cookers are jacketed, on the sides, top, and door, with a new and very efficient non-conducting material, by the use of which a **saving** of gas to the extent of **40 per cent.** is effected.

Gas Companies who are selling or hiring stoves should see these stoves. Catalogues and particulars on application to

JOHN WRIGHT & CO., ESSEX WORKS, BROAD STREET, BIRMINGHAM.

London Warehouses: 155a, Upper Thames Street, 1, Little Bush Lane.

TANGYE BROTHERS AND HOLMAN,

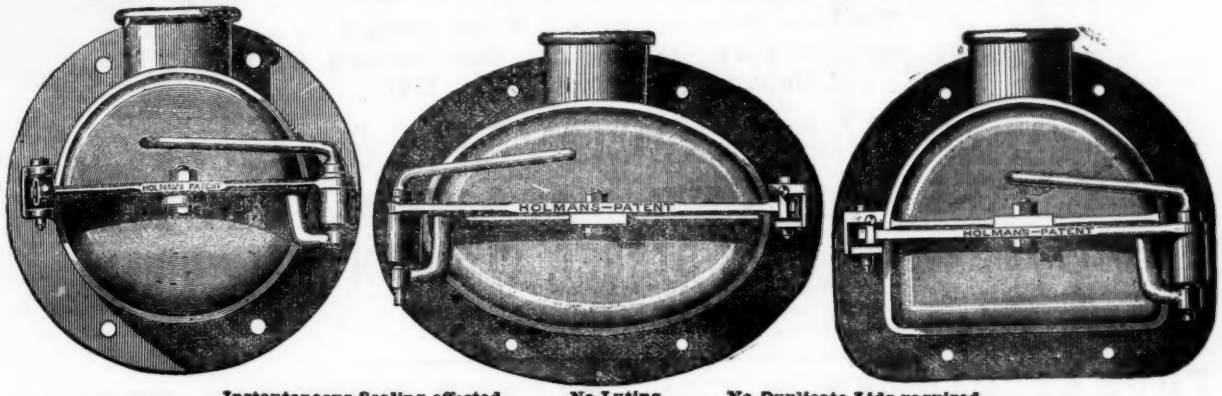
CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

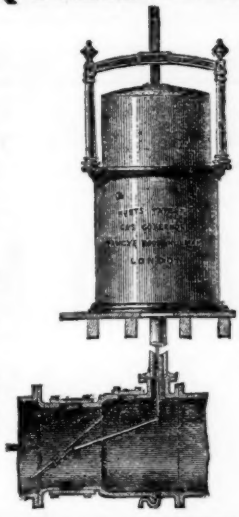
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

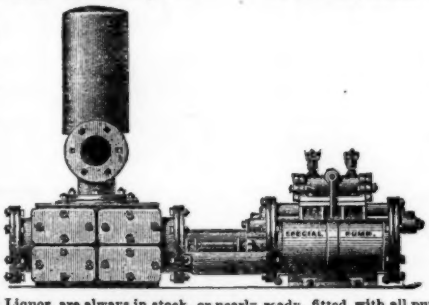
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

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London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters bv the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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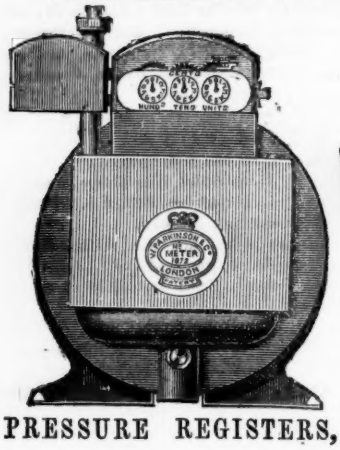
THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,

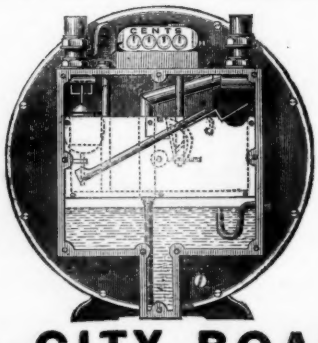
STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

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No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 30, 1879.

Circular to Gas Companies.

THE results of the past half year's working of the Metropolitan Gas Companies, as shown in the accounts which are issued in anticipation of the half-yearly meetings of Shareholders, exhibit a continuous prosperity. Without referring at present to the operations of those Companies who are under the sliding scale, we may mention that two of those who were working under the Act of 1860 are, as may be supposed, able to pay full dividends, and carry forward a considerable balance. The London Company, for example, after bringing down the price of gas to 3s. 3d. per thousand feet, find themselves for the past half year with the balance of net revenue amounting to £36,880. After providing, out of this sum, for all preference charges, there remains to pay the dividends on ordinary capital a balance of £22,468. Now, as only £19,370 are required to meet the dividend on ordinary stock, it follows that there is left a balance of £3098 to be carried forward or placed to the reserve-fund. We note again with satisfaction that the details of the working accounts are remarkably good. The yield of gas per ton of coal was excellent, and the unaccounted-for gas a relatively small amount. All concerned with the Company may be congratulated on the satisfactory condition of affairs, which does them much credit, and which will be duly expatiated upon to-morrow week, when the half-yearly meeting of Shareholders will take place. Notwithstanding the reduction in price, the rental continues to increase in amount, and, happily, the London Company had a good half year for the sale of residuals.

The Phœnix Company also had a successful half year's working. The balance of revenue for the past six months amounted to £51,116; and, after payment of full dividends on all classes of shares and stocks, there is left a sum of £1716 to be carried forward. The continually increasing business of this Company necessitated their making provision for future needs, and to provide for these the Directors have in hand considerable additions to their coal stores, and a further extension of their carbonizing apparatus. By these means we may anticipate that the coming winter will be safely tided over, and probably, if matters go on quietly, there will be sufficient power to provide gas in abundance for the whole of the Company's limits for some years to come. During the past half year, 85,862 tons of common coal and 2479 tons of cannel were carbonized and used in the Company's works, and the average yield of gas was over 10,000 feet per ton. Of this the greater part was sold, the unaccounted-for gas being relatively small. We are happy to say that in the report of the Directors no complaint is made of the want of sale of residuals. Coke, in fact, produced £23,393, which bears a fair relation to the cost of coal; and the other residuals fetched good prices; so that the Company may well be congratulated on the results of their half year's business.

The accounts and report of the Directors of the Alliance and Dublin Consumers Gas Company have been issued in anticipation of the meeting to-day. The balance of profit for the past half year amounted to £32,457, which leaves the Directors the power to pay 10 per cent. dividend, and carry forward the sum of £2957, which will make their unappropriated balance £35,362. It is against the payment of full dividends and these appropriations that some Irish journalists protest. They suggest that the Shareholders should content themselves with a 9 per cent. dividend, and that any excess of profit necessary to pay a higher rate should go in reduction of the price of gas. These good-natured gentlemen appear to forget that for several years the Shareholders received very small dividends, and for two years none at all. The large reserve-fund, we may take it, is as much a protection to Consumers as to Shareholders. It is because the Company are in possession of such a good reserve that they are enabled to reduce the price of gas as they did at the beginning of this year, and, at the same time, protect the interest of the Shareholders. Up to this time, at all events, no proposition has been made for the payment of back dividends, so on that score the citizens of Dublin have nothing to complain of. As a matter of course, the Company still continue to be annoyed by the Corporation, whose modes of attack vary. At the present moment the complaint is that the pressure in the mains is too high, while men of experience think it too low. To the Corporation the matter cannot be of much moment, while to the Company it would be a matter of serious importance. In any case, the Directors are endeavouring to obviate all sources of complaint by replacing the present feeding-mains with others of larger capacity. As our readers know, a Bill promoted by the Company received the Royal Assent in the past session, which, among other things, enables them to manufacture and supply apparatus for the consumption of gas for other than lighting purposes, such as cooking and heating, and also for gas-engines for the production of motive power. Great preparations are being made for entering upon this business as speedily as possible. There can be no doubt that the business once begun will be extremely profitable to the Company. The apparatus will not perhaps bear any very great profit, but what we look forward to is a largely-increased demand for gas in consequence of its use. It is, we believe, the universal experience, that the consumption of gas is greatly increased wherever such appliances are adopted, and we hope that other Companies who obtained similar powers last session will exert themselves to bring gas-stoves and other apparatus more into use as quickly as possible.

The little Harrow District Gas Company had a pleasant meeting on the 24th inst. The business of the Company continues to increase, and would increase much faster if the Company could reduce the price of gas; but the difficulty and expense of getting coal to their works acts as an effectual barrier to any reduction, at all events at present. There seems to be a prospect that presently a new railway will carry coals to within an easy distance of the works, when cheap cartage may allow of some diminution of price. The district of the Company rapidly improves, and nothing but

cheaper gas is wanted to add very largely to the business of the Company. The town of Harrow, we gather, does not increase very rapidly in population; but, as Mr. Glaisher puts it, easier and cheaper railway communication must naturally attract residents to so beautiful a spot. The Company, of course, paid but a limited dividend—viz., six per cent. per annum; but after a few years we feel satisfied that increased business will bring to the Shareholders larger profits.

The annual general meeting of the Shrewsbury Gas Company was held on the 25th inst. The Company are in a very prosperous state, and, of course, pay their full authorized dividend, which is, however, only 7½ per cent. The undertaking is being rapidly extended to meet the increasing demand for gas in Shrewsbury, and probably the Company will have to make further additions to their distributing plant, for they are about to reduce the price of gas to an extent which is certain to bring additional consumers, and, what is more, induce their present customers to consume much more gas for cooking and heating purposes. This is the universal experience. Sell gas cheaply, and consumers are certain to be found.

There is a move going on in Limehouse and Battersea to obtain the application of the average meter system to the public lights in the two districts. As usual, hesitation is expressed, and there is the customary desire to learn the results obtained by those parishes who have already adopted the system. The saving would, of course, depend upon two or three causes, one of which is the number of hours the lamps will be kept burning under the new system. We know that in Paddington and St. Pancras the bulk of the saving has been produced by curtailing the hours of lighting. But this says nothing against the system, which possesses great advantages. Under it the Local Authority and the Gas Company are brought into perfect accord. There are no longer disputes as to the quantity of the gas consumed in the public lights. The Vestry are perfectly satisfied, and so are the Gas Company. This is a great recommendation to the plan, which we still hope will be adopted in the two parishes named above.

The Winter Instructions of the Metropolitan Gas Referees have just been issued. They prescribe the usual limits of sulphur for this period of the year, in which, as our readers know, allowance is always made for winter make, and the possibility of less perfect purification than in summer. Within these limits we are happy to say the Gas Companies find it easy to keep the impurity, and therefore we never again expect to hear of prosecutions for default, unless caused by accident or some unforeseen circumstances.

We notice that the electric light has been employed, and it is reported with much success, to light up between decks H.M.S. *Inflexible*. Mr. Wilde, of Manchester, has superintended the experiments, with which the Lords of the Admiralty, at a recent visit, were much gratified. For the purpose to which the electric light was adapted in these experiments, it seems entirely applicable. Turret ships are, it appears extremely dark between decks, and require special illumination; oil lamps, at the best, afford but a smoky light, vitiate the air, and add to the temperature of an ill-ventilated space. The electric light, therefore, comes in with admirable effect. There is brilliant illumination, a very small amount of heat, and comparatively little vitiation of the atmosphere. There is in such cases as this no question of competition with gas. It is, however, not many years since that a sanguine inventor proposed to light all steamships between decks with gas generated in the furnace-room; but we believe the invention never came to anything. Mr. Wilde, at Portsmouth, the other day, only produced four lights from one of his powerful machines, although such a machine as his, it is said, is capable of producing six; but a great many more than six lights will be required to illuminate a turret ship below the main deck. We may also note that vigorous preparations are being made to light up Waterloo Bridge with the electric light at an early date.

When it is wished to puff the electric light, in opposition to gas, it is a common thing to say that no deleterious products are formed during the combustion of the carbon points, and that acid vapours are especially avoided. Sulphuric acid alone is thought of; but our lamented friend, Mr. Wills, was, we believe, the first to point out that nitrous acid is formed when the electric arc is displayed in contact with atmospheric air. Mr. Wills died too soon to complete experiments, by which he would, no doubt, have determined the exact quantity of the acid above named produced by the electric arc for various periods. The work, however, has been taken up by Professor Dewar, who, in a paper which he read at the recent meeting of the British Association at Sheffield, gave a detailed account of the amount of nitrous acid produced with the electric arc. It appears from his experiments, says our contemporary, *Engineering*, that with a Siemens lamp, adjusted to give a long arc, there was an average development of nitrous acid equal to half a gramme—that is, between seven and eight grains—per hour; but with a short arc the amount of nitrous acid thrown into the air was very much less, not exceeding 0·08 gramme per hour. A similar series of experiments revealed the fact that the Jablochkoff candle discharges into the air a much greater quantity of nitrous acid than does the arc produced in the ordinary way. This amount is nearly double that produced by the Siemens lamp, being as much as one gramme—from twelve to fifteen grains—per hour; and this amount is still further increased if the insulating material be removed. The reason of this is that the lime absorbs some of the nitrous acid, nitrite of lime being produced. Professor Dewar's experiments show that in places where the electric light is used, it should be placed under a ventilator by which these deleterious compounds may be carried away, or it would have injurious effects on health as well as the binding of books. The substance produced, Professor Dewar found to be nearly pure nitrous acid.

Water and Sanitary Notes.

THE report of the Directors, with the statement of accounts, of the East London Water-Works Company has just been issued. The business of the Company, as a matter of course, continues to increase, for people must have water, and in the Metropolis there is no other source but a resort to the Water Company supplying the locality. An increase in the Water Company's business may be taken to indicate approximately the number of new houses built in a district. East London grows apace, and the Company's business must of necessity increase with the development of residentiary property. That great want about which so much has been said—a constant supply—is almost fully met by the Company. They now give it to 92,856 houses out of 120,459, the total number they supply. This having been effected under considerable discouragement, is a great triumph. The report naturally refers to the statement made by Mr. Cross in the course of the debate on Mr. Fawcett's motion, in which he said that if the Government took over the Water Companies, undertook the management of the supply, and bought up the stock of the existing Companies, the price would be as it stood on the 30th of June last. This would be so manifestly unjust, that we were quite sure the Water Companies would resist it to the utmost, as it would amount to the downright confiscation of the profits on much of the Companies capital, and we are certain that a very strong opposition will be raised to prevent so glaring an infringement of private rights. Whenever the Companies are bought they must be paid for on a valuation made at the time, due regard being had to the prospective value of certain portions of their capital. On such a point as this we are certain all the Companies are agreed, and they will present a firm phalanx in opposition to Mr. Cross's confiscatory scheme. The profits of the East London Company applicable to dividend for the past half year amount to £66,906. The sum required for dividend amounts to £53,858, which leaves the Company with £13,048 to be carried forward to next account. It is remarkable to see with what avidity the Company's debenture stock is taken up. The last issue offered to the Proprietors was raised at a premium of 10½ per cent. The premiums realized on this issue amounted to no less than £7305, which, of course, is carried to capital. The dividend proposed for the past half year is at the rate of 7½ per cent. per annum, free of income-tax.

Dr. Sedgwick Saunders, the Medical Officer to the Commissioners of Sewers of the City of London, brings numerous complaints against the New River Company. He says, in a report presented to the Commission on Tuesday last, that instances occur of deficient water supply, and that sometimes water is cut off without any intelligible reason, while in others the supply is withheld where all the fittings required by the most exacting regulations are in good working order. These are grave charges, and, coming from such a source as they do, deserve attention; but we have to hear the other side. Probably where Dr. Saunders sees no intelligible reason for cutting off the water, the Company's officials could show a powerful motive for adopting that course; and where Dr. Saunders sees fittings perfectly conforming with the regulations, the Inspectors of the Water Company may discover

defects which render it unsafe to put on a supply. We cannot suppose that the New River Company—so liberal with their consumers—would go out of their way to excite public indignation in a matter of this sort, and we feel satisfied that an explanation will be forthcoming from the alleged defaulters.

How many times the Edinburgh Water Trust have been in Parliament with Water Bills of late years we cannot undertake to say, but at all events they appear to be about to promote another measure to raise money to complete the Moorfoot scheme. How much happier the citizens would have been under a Company who would have saved all the superflous talk, we will not undertake to say; but certain it is that Companies have carried out as important schemes without making so many applications to Parliament. The Water Trust are very partial to parliamentary proceedings, and what leads to them. They, however, seem to have great attractions to some persons connected with water undertakings. We do not speak of either engineers or writers to the signet; but to some it must be pleasant and profitable to have a Water Bill in hand.

That little *coterie*, the International Association for the Promotion of Means for Improving the Supplies of Drinking Water to Populations, has been holding a meeting at Amsterdam, under the presidency of our friend, Mr. E. Chadwick, C.B., who had an address delivered for him in French. Mr. Chadwick would, of course, quite revolutionize our present water supply, and place that and our sewerage system under the superintendence of one governing body, who would eliminate all sources of danger to health that could occur in a large town. As regards the choice of a water supply, we are not at all disposed to quarrel with Mr. Chadwick. A pure spring water is, no doubt, to be preferred for drinking purposes. But how seldom is it to be found. It is all very well to recommend the abandonment of river sources, but there is a vulgar proverb which tells you not to throw away dirty water before you have clean. Many of the large towns in England are now supplied from rivers, and we do not know that they at all suffer from imbibing what Mr. Chadwick considers "the polluted fluid." However that may be, our Amsterdam friends will find it enormously difficult to change our sources of supply. Amsterdam has not, we believe, been an unhealthy city, but strange stories have been told of the water with which the inhabitants supply themselves from the canals.

We are glad to find, from a communication received from Alderman Taylor, the Chairman of the Health Committee of the Rochdale Town Council, that it is not in consequence of any failure in carrying out the "pail system" in the town that drainage works and an irrigation farm are to be instituted. The pail system is, in fact, in use by 67,000 out of 73,000 of the population, 4000 of the remainder using old privies; but it is hoped in a year or two that there will be no old privies in the town. Alderman Taylor is perfectly correct in drawing a distinction between human excreta and sewage, although one is usually a component part of the other. We in the South commonly speak of "wet" and "dry" sewage, meaning thereby, in the one case, water-carried excreta, and, in the other, some preparation of the chemical treatment of sewage, or such a compost as is found in the Rochdale pails. These two latter pass here as dry sewage. At the fact that the dry-closet scheme has not proved a failure we rejoice, for from its first institution it had our hearty support. It was a newspaper paragraph which led us into the belief that the pail system was to be abandoned. The Corporation of Rochdale may be perfectly right in expending the large sum of money they propose on an irrigation farm. We have, however, several times remarked on the increasing liabilities of Local Authorities, which are beginning to create alarm all over the country; and £112,000 is a large addition to the debt of Rochdale. When it is considered that this money is not likely to prove remunerative for a generation, the matter looks serious for the ratepayers; but we shall be glad if we live to congratulate them on making a profit out of their sewage farm.

THE LATE MR. LAMING.—We have to acknowledge still another, but trust not the last, contribution to the fund for the relief of the widow of the late Mr. Laming. Mr. Stephenson Clarke, of St. Dunstan's Alley, has sent a cheque for £20, and expresses a hope that Mrs. Laming "will find many friends in her troubles." Now that our readers are reminded the subscription list is not closed, we expect several more contributions will come in; and that those who are not able to send such large amounts as those already acknowledged, will yet not be deterred from joining in so worthy an object.

SEWAGE WASTE.

SUNDRY letters in *The Times* have lately reminded the public that the disposal of town sewage is still an unsettled problem. Mr. Mechi appears to have discovered that our blundering over the sewage question is partly the cause of the present agricultural depression. We are, in fact, at the beginning of the end. We are casting our sewage into the rivers and the sea, and, as a consequence, the land is robbed of its proper due. The impoverished soil will by-and-bye fail to yield the requisite amount of produce, and something like national bankruptcy will follow. Liebig is quoted, where he says: "Large towns, like bottomless pits, gradually swallow up the "conditions of fertility of the greatest countries." We are even impoverishing other regions besides our own. We have exhausted the early settled lands of America, and now the virgin soils of the Far West are undergoing a similar depletion. Mr. Mechi asks, "Are we a sane people, or are we so "recklessly rich in agricultural production that the waste of "millions is to us a matter of little import?" The sewage is wanted for the land, but we throw it into the sea, and then send abroad for artificial manures as well as agricultural produce. If we were wiser we might grow at home—so far as climate will permit—that which we fetch from abroad, and we might use the manure of towns instead of the manurial ingredients which we import. "Wilful waste makes woful "want;" and the woe is denounced against us unless we amend our ways in the disposal of town sewage.

"A destructive cancer is silently, gradually, but certainly "undermining British agriculture." Such is the message from Tiptree Hall to the towns of Great Britain. In the good old days of those detestable cesspools which we were so glad to get rid of, there was no such peril as that which now besets us. At least so Mr. Mechi argues. The excreta used to be carted off by the farmer, and the town replenished the land, while the land fed the town. Now the town takes from the land but gives nothing back. Mr. Mechi calculates that it takes the annual produce of twenty thousand acres to feed the Londoners for a single day. Accordingly, for 365 days it must require 7,300,000 acres. It has been stated on good authority that the sewage of one hundred persons will fertilize an acre of land. To fertilize these acres would, therefore, require a population of 730,000,000, or at least half the population of the globe. If we estimate the population of all England at seven times that of London, we find—on the basis of Mr. Mechi's calculation—that three times the population of the globe would fail to furnish sewage enough to fertilize the acres necessary to provide food for the population of England and Wales, supposing it required one hundred persons to fertilize an acre. We may bring the figures down to any ratio thought proper. But we presume that fewer than twenty-five persons per acre would certainly be deemed insufficient. Taking the population of London at 3,600,000 persons, these would fertilize 144,000 acres per annum, an area which, on Mr. Mechi's reckoning, would only furnish food enough to sustain the Metropolitan population for a week. If we accept the statement that the sewage of one hundred persons is requisite for every acre, the fertilized area would not yield food enough to sustain the population for a couple of days. In short, the reckoning appears to be this—that while it takes two acres per head to feed the population, it requires the sewage of fifty or from that to two hundred persons to fertilize those acres. At this rate there is a waste going on for which town sewage is not altogether responsible.

But while town sewage cannot do everything, it may be expected to do something, and we suppose the argument amounts to this—that the sewage of towns is necessary to fill up the deficiency that remains after the farmer has done all he can with the manure which comes from his farmyard, and from the presence of flocks and herds in his fields. Theoretically, the sewage of towns ought to fertilize a much larger area than we have allowed in the foregoing calculations. Baron Liebig went so far as to say that each unit of the population can, on an average, supply, with the nitrogen absorbed from the atmosphere, sufficient manurial matter to raise from an acre of ground "the richest possible crop every "year." We may, doubtless, consider that the discharge of town sewage into the rivers and the sea is a form of waste. But, if we prevent the waste, are we sure of a favourable balance-sheet? It may be right that we should bear the loss, but if the transaction be unprofitable, we must then fall back on the sanitary argument. Mr. Mechi says: "I listen with "astonishment when people talk to me of the difficulty and "cost of transferring the manurial treasures from the sewers "to the land." He contrasts the cost of extending the Metropolitan District Railway a single mile with the expense

of taking London sewage down to the Maplin Sands. But will Mr. Mechi also compare the probability of a dividend in the two cases? Perhaps the railway has not a very good chance; but the public are more ready to take shares in railway projects than in sewage schemes. If only the way were clearly shown for utilizing sewage at a profit, Mr. Mechi might cease to preach and to predict.

Following Mr. Mechi's startling protest there appeared a letter from Dr. Hawksley, who proclaimed to all the readers of *The Times* that "the only successful solution of the ques-"tion" was that known as the "dry-earth system." But, in making this assertion, Dr. Hawksley put himself hopelessly at issue with high official authorities, who had more than once pointed out that the dry-earth and pail systems were mere palliatives for cesspit middens, and had the grand defect of leaving a volume of sewage to be dealt with by other means. The sewage of towns without water-closets is very little weaker than that of towns where water-closets are general. Thus the Rivers Pollution Commissioners state that there is "a remarkable similarity of composition between the sewage "of midden towns and that of water-closet towns." The Commissioners go on to say, "Neither is the case substantially "different where earth-closets are substituted for the Lanca-"shire middens, for the sewage from Broadmoor Lunatic "Asylum, in which these closets are partially used, exhibits "no exceptional degree of weakness." In volume, also, the discharge from the sewers is nearly equal in the two classes of towns. The volume and the pollution being very nearly equal, the economy arising from the rejection of the water-closet appears to be inappreciable. When Mr. Mechi talks of the benefit which accrued to the farmer when the latter removed the contents of the cesspits from the towns to his fields, he overlooks the fact that the farmer took away but a very small portion of the manurial liquid, in which resided the greater part of the nitrogen. The solid matter was removed, but this was the least valuable portion of the product. The liquid manure proper to the towns soaked largely into the soil, and so was lost. The water-closet really conveys all the manurial ingredients away from the town, only it happens that these are largely diluted with water. The advocates of sewage utilization are generally desirous of obtaining the sewage with as small an admixture of water as possible. Hence they propose a dual system of drainage, in which the rainfall and subsoil water shall be kept separate from the house drainage. Mr. Richard Grantham believes that if this plan were adopted, the pecuniary loss which now accompanies the treatment of sewage would be converted into a gain, so that sewage, instead of being wasted, would be sought after as a profitable manure. It is argued that the excessive dilution of sewage which accompanies the prevailing system of town drainage, whereby rainfall enters the sewers from above and subsoil water from below, diminishes the chance of a profitable return, both by the deterioration of the sewage, and by the enormously increased volume of liquid which has to be distributed, involving sometimes a heavy charge for pumping. Mr. Isaac Shone, the present Mayor of Wrexham, observes that not only are the difficulties and expense of dealing with sewage chemically, and pumping it, increased tenfold by the variable addition of subsoil and rain water, but the necessity of "storm overflows" in connection with the ordinary system of sewerage occasions a frequent discharge of foul liquid into the nearest watercourse.

Admitting that the exclusion of surface and subsoil water would facilitate the treatment of sewage, both chemically and agriculturally, we are yet in this difficulty—that the evidence collected by the Rivers Pollution Commissioners creates a serious doubt whether the dual system of drainage would not really create two kinds of sewage. The so-called surface water is often far from pure, and we see that it matters very little whether a town is water-closeted or not, so far as the discharge of a polluting liquid from the town sewers is concerned. It is true that the storm outlets are objectionable where everything is allowed to enter the sewers, but they may be less hrutful in their occasional action than sewers continually discharging foul water, even though the latter be disconnected from the water-closets. In the case of London, Professor Way has observed that, "Considering only "the composition of the liquid which reaches the sewers in "times of rain from the streets, it seems pretty certain that "it would be as valuable in a manurial point of view as the "ordinary contents of the sewers." Nevertheless, the conditions vary greatly in different localities. Where the rainfall is large, and where a large quantity of water comes down into the town area from an adjacent agricultural district, some separate provision for surface and subsoil water seems almost imperative. But the water that proceeds from the town itself, even though at first it may not be what is technically termed sewage, is evidently capable of coming under the ban of a law which prohibits the pollution of a stream. Our sanitarians object even to the quality of land waters, as tainted by manure. Much more may they object to a liquid which has swept the streets and lanes of a town. Something may be done in the way of separating sewage from mere water, but we do not at present see in this proposal so great a boon as some contend for. It is very well to adopt as a motto—"The rainfall to "the river, the sewage to the land;" but it is very difficult to catch the rain water without some kind of pollution being mingled with it. Mr. Grantham says, "Where "it is practicable, sewage should be discharged into drains "separate from those used for storm and subsoil water." But if, after all, we are to carry off everything, where is the saving? Two sets of sewers for the same total volume will, in many cases, be found dearer than a single set; and, unless a portion of the house drainage is sent into the sewers which are to take the surface water, it is not likely that there will be much diminution in the sewage which goes to the farm where it is to be used for irrigation. On the whole, we fear this latest discussion of the sewage problem is not likely to render any great help towards the end we have in view. Certainly, we do not see how the volume of the London sewage is to be diminished, unless it be by a more economical use of the water supply.

THE GOVERNMENT AND THE METROPOLITAN WATER COMPANIES.

We endeavoured to show last week, in an article under this heading, that it is no fault of the Water Companies that London is not properly supplied with a sufficient quantity of water. Nearly double the quantity really needed is actually delivered to the consumers, and if half of it is wasted by imperfect fittings and carelessness, for want of a supervision which it is believed would be unpopular, it is not fair to blame Directors, who are already so hampered by threatened opposition as to be timid and disinclined to trespass further on the patience of their customers.

We have said that the water supplied to the Metropolis should always be of a quality "such that the use of it for "drinking purposes can, under no conditions of weather or "circumstances, become injurious to health." There is no doubt that this is asking a great deal, and we may even say that it is a condition almost impossible of obtainment in many country districts, in spite of every effort, and where no money is spared. But in London, difficulties must not be admitted in a matter where public health is really concerned. If water from the Thames will not answer the requirements, some other plan must be resorted to. If nothing else will do, we must go out of the district to the Welsh or Cumberland lakes, or seek for a supply from some subterranean source. It is, however, only fair to consider the exact conditions of the problem. We must know what is meant by the term *pure water*, where and how it is to be had, how it differs from the present supply, and what are the real differences in health between places enjoying this boon and those deprived of it.

Now, it is perfectly certain that absolutely pure water never was, never will, and never can be supplied to any town, and it is more than doubtful whether it is really desirable, in any sense, that it should be so supplied. Water, when chemically pure, is perfectly neutral, having neither smell nor taste. It has the property of dissolving and holding in solution some quantity of almost every known substance, from air and gases to iron and lead, wood and stone. Left for any definite period exposed to the air in any vessel, it will be found to have taken up by solution a portion of it. Whether, then, it be passed through lead or iron pipes, or stored in brick or stone or painted wooden tanks, the water will soon be found to have been affected by the material. The rain, as soon as it has formed from the cloud, and before it falls to the earth, has already begun to suck in what are called impurities, and is found to contain ammonia. If it falls to the earth and flows over naked limestone or chalk, it becomes hard by absorption of carbonate of lime. In some way or other it always finds salt. As it flows over the surface in a river it takes in organic carbon and organic nitrogen. As it enters the earth by percolation, it not only takes with it all these substances, but absorbs others. As it circulates in the earth's interior, or reaches the surface in springs, the same history attaches to it. If we refer to the report by Dr. Frankland in the number of the Journal for the 16th inst., we find that the deep-well waters of the Kent Water Company contained, during all the month of August, nearly 32 grains of solid matter in every gallon.

In other words, the Company delivered more than 17½ tons of stone per day to their customers, together with the water the purity of which is so highly esteemed. In addition to this mass of stone there was also delivered nearly 76 lbs. weight of organic carbon, nearly 12½ lbs. of organic nitrogen, and about 400 lbs. weight of nitrogen in the form of nitrates. Finally, there was so much chlorine as to indicate the presence of 360 lbs. weight of common salt. It is true that, while there was much less in proportion of total solid matter of nitrates and of salt in the Thames water supplied by the other Companies, there was three or four times the proportion of organic carbon and organic nitrogen; but it is important to notice that the difference is only one of proportion, and, as it has never been suggested that the organic carbon and nitrogen are injurious to health when present to the very small extent recorded (the former being in the Thames waters about one part in three hundred thousand, and the latter about one part in three millions), there is no real ground for the assertion that this water was "so strongly "polluted with organic matters as to be quite unfit for dietetic "purposes." It might have been remarked with equal truth and fairness that "the Kent water was so loaded with mineral "matter as to be quite unfit for the ordinary domestic require-"ments." During the whole month, as has already been pointed out, the health of London was unusually good, and the death-rate unusually low. It is perfectly certain that water very slightly turbid, and even pond water, which is rarely without moving organisms discoverable by the microscope, is not for that reason unwholesome, and is greedily swallowed by animals. The turbidity of the Thames water did not affect the health of the inhabitants, and was only discovered by Dr. Frankland. It is certain that water chemically pure is not supplied to London by any of the existing Companies, while it is equally clear that the health of London is exceptionally good. The towns around London supplied by wells in the chalk are not remarkable for their better condition in regard to health, while some of them—Croydon being a striking example—are frequently suffering from fever. Croydon, however, is supplied with deep-well water.

There can be no advantage in lake water over that conveyed by rivers. The conditions and liabilities are the same, except that the lake water is not so quickly or thoroughly aërated, owing to the smaller amount of movement and disturbance of the water. Water impounded in reservoirs must, in like manner, be exposed to the same chances of dangerous pollution as that of streams and lakes, and, though more free from substances that can be detected by analysis, is quite as much liable to the presence of the invisible poison germs. It may be thought that as a river in its course is exposed for a long distance to the chances of pollution, the danger is in this way increased. But for all recognizable impurities determinable by analysis this is remedied by the oxidation rapidly effected in a flowing stream. As a matter of fact, the large towns on the Thames above Teddington—Oxford, Reading, Windsor, Kingston, Richmond, Brentford, and Isleworth — are all remarkably free from the diseases induced by poisoned water. Some are supplied from wells, some from the Thames.

Compared with available water from chalk, or with such water as could be obtained from natural lakes or artificial storeage reservoirs, London can have nothing to complain of in being supplied with water taken from the Thames at a point above tidal influence, provided due care is exercised to keep out the sewage of towns situated on its tributaries. All the towns of any magnitude now possess sewage works, and are precluded from fouling the river. The Thames Conservators have, at least, effected this improvement, and are now empowered to prevent the passing of foul water from manufactures into the river. The only Companies not using the water of the Thames exclusively, but taking other river waters, are the New River and the East London; the former being entirely, the latter partially supplied from the River Lea. The East London Company mix the Lea and the Thames waters; the New River mix Lea and chalk spring waters. There is little difference in the quality, and none in the salubrity of the water or the health of the districts supplied. These various sources of supply have been going on for many years, the quality of the water has gradually improved, and enormous cost has been incurred, at the respective intakes of the Companies, to exclude flood waters, and to provide depositing-ponds and filter-beds. If the water were delivered to every house as it leaves the Companies mains, there would even now be little ground of complaint. We do not all keep glass tubes with glass ends to enable us to see, through a stratum of water two feet thick, the "very pale yellow" colour of which the Thames waters were accused in Dr. Frankland's last report. Probably most of us would hardly find it out if we were to look. The *minutiæ* that so affect the imagination of the reporter are visible only to himself, and hurt no one. But there is something to be said on this score. These *minutiæ* need not exist; and if the Companies would attend to their own real interests, they would not exist. Whatever fault there is, is the result of imperfect filtering. Enough money has not been spent by some of the Companies on depositing-tanks where several days supply could be stored, and much more must be expended in cleaning and renewing filters before justice is done to the river water. These are duties that have not been sufficiently attended to, and as regards quality, they are really the only ones, for the Companies have no control over the river, and the most they can do is to prepare sufficient storeage to allow the disturbed water during flood to pass by. This is a matter with which the Government, acting for the public, should have power to interfere. They might safely and properly require much to be done, leaving the various Companies to do it as they please, provided only that the result attained is satisfactory.

There is another measure also that devolves on the Government, and towards which something has been attempted, though as yet insufficiently. We mean River Conservancy. Every river—the Thames most of all—should have a Board of Conservators, and the Board should be enabled to exercise reasonable powers to oblige riparian owners and dwellers on streams to respect the rights of those who live lower down the stream, and receive the water after they have done with it. It is not every river that is used for supply purposes, and the duties of River Conservators are by no means confined to the condition of the water, but it should be under their control. Unfortunately, the constitution of the present Board of Thames Conservators is not favourable to the prosecution of measures of real improvement.

Lastly, there is the great question of pollution, as derived from the present mode of intermittent supply. Practically this is the real evil, and may almost be regarded as the only objectionable part of our present system. So long as the water is delivered by the Companies into cisterns at intervals, so long will there be complaints as to the quality as well as the quantity. Water when drawn from cisterns in a London neighbourhood, the cisterns being rarely emptied and cleaned, and often imperfectly covered, may well present all the bad qualities attributed very falsely to the filtered Thames water as it issues from the taps at the Companies mains.

After all, then, we come back to the same point. Ensure and render obligatory constant service, and we have all that is wanted. There could then be no complaint of quantity, and there would be none of quality. Even in the hottest summer the water would be reasonably cool, and quite fit for domestic use*. It would be free from all preventible impurities after being impounded for a time, filtered effectively, and delivered from the mains, and water would always be available for fires. With such a supply, whether entirely from the Thames, consisting of a mixture of Thames or Lea water with well water from the chalk, or being chalk-well water alone, London would be supplied perfectly and admirably, whether the distributing agency consisted of several Boards of Directors, rivalling each other, all interested in the efficiency and economy of their works in order to ensure a good dividend, or Government Commissioners who, to do real work, must be equally well paid whether the result to the consumer is satisfactory or otherwise. The question of cost might be rendered uniform and regulated by Government, and no purchase of the Companies by Government could in any way diminish this cost, though it might very well increase it. Payment by meter would prevent all ground of complaint on this head, and would render the consumer economical.

CRAVEN ARMS GAS COMPANY, LIMITED.—The ordinary general meeting of this Company was held last Thursday—Mr. A. G. Brookes in the chair. The report of the Directors stated that the works were now completed, and had recently been put into operation, so that gas was being regularly used. The Directors regretted that the working had been commenced too recently to admit of any available profit being made, but hoped that the next statement of accounts would show a favourable result. The revenue account to June 30 last showed that the amount paid for coal, wages, lime, rent, and coke amounted to £52 12s., and the receipts to £66 7s., including interest, which left a balance of £13 15s. net profit. The station was first lighted with gas on the 6th of May last. The report was adopted and a special general meeting followed, when the Chairman proposed—"That the Company be and is hereby authorized to raise not exceeding the sum of £2000 sterling on debentures or preference shares, bearing a preferential interest at the rate of 5 per cent. per annum, and to apply the same for the general purposes of the Company."

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* In a paper read at the recent meeting of the British Association, by Mr. Baldwin Latham, C.E. (see JOURNAL, *ante* p. 406), it was shown from observation that the temperature of the water supply of a town was independent of the temperature of the water at its source of supply.

Communicated Article.

SULPHUR IN COAL GAS.

By "DELTA."

What is the function of sulphur in coal gas? Does it poison our atmosphere, rot our libraries, corrode our brasses, and gnaw through our pictures? Or does it purify our dwellings, and clarify the air we breathe? Both questions will be answered in the affirmative by applying in the right quarter. The "Sulphur Question" has been debated with a directness of chemical contradiction, and a bitterness of chemical retort, which bid fair to revive for the *odium scientificum* the evil name of its theological relative. Let us examine the question impartially, if possible. To do so we must briefly review the character of the material, and the nature of the changes brought about in the processes employed in the manufacture of gas.

The coal used in England for making gas contains a varying amount of iron pyrites—*i.e.*, persulphide of iron. Iron pyrites, when heated in a closed vessel, is decomposed into magnetic sulphide and free sulphur:—

$$\underset{\text{Iron Persulphide.}}{3\,FeS_2} = \underset{\text{Magnetic Sulphide of Iron.}}{Fe_3S_4} + \underset{\text{Sulphur.}}{S_2}$$

This magnetic sulphide, when heated in a current of hydrogen, yields hydrogen sulphide and iron protosulphide:—

$$\underset{\text{Magnetic Sulphide of Iron.}}{Fe_3S_4} + \underset{\text{Hydrogen.}}{H_2} = \underset{\text{Protosulphide of Iron.}}{3\,FeS} + \underset{\text{Hydrogen Sulphide.}}{H_2S}$$

According to the researches of Regnault, aqueous vapour gradually decomposes the protosulphide at a red heat, forming hydrogen sulphide and protoxide; but a portion of the sulphur always remains in combination with the iron, even after several hours ignition. The protoxide thus formed decomposes more steam:—

$$3\,FeO + H_2O = Fe_3O_4 + H_2$$

When coals are distilled at a bright red heat, the sulphide of iron melts and is decomposed, and a portion of the sulphur, varying with the temperature, comes over with the gases, chiefly in union with the hydrogen as sulphuretted hydrogen, and partly in union with carbon, or with carbon and other elements. The temperature at which the distillation is made, and the time during which the coals are heated, are important elements in determining the amount and nature of the gaseous sulphur compounds. It is during the latter part of the distillation that most sulphur comes over. Probably until the greater part of the dense hydrocarbons are given off, the temperature does not rise sufficiently high in the interior of the mass of coal to decompose the iron pyrites, for the amount of heat absorbed in the formation of the gases and vapours keeps down the temperature of the solid coal. When the charge acquires a higher temperature, the pyrites is decomposed, and the freed sulphur divides itself among the bodies present capable of uniting with it. By far the larger portion unites with hydrogen to form hydrogen sulphide. This reaction is probably a case of direct union between two heated elements. Scheele, who first investigated this gas with accuracy, produced it by heating sulphur in hydrogen gas, then known as "inflammable air," and by some considered to be "phlogiston" itself; and he accordingly announced the gas to be composed of sulphur, phlogiston (hydrogen), and heat. The temperature required for the direct union of sulphur and hydrogen is not very high. If hydrogen is passed through boiling sulphur (840° Fahr.), combination takes place between them. Another portion of the sulphur unites with carbon to form carbon bisulphide, some of which is doubtless decomposed before the gases are cooled, the sulphur transferring itself to the hydrogen. Carbon bisulphide is manufactured by a process closely resembling in its nature that by which it is produced in the gas-retort. When sulphur vapour is passed over red-hot coke, direct combination takes place, and carbon bisulphide is collected as a liquid in well-cooled condensers. Moreover, in the manufacture of carbon bisulphide certain other sulphur compounds are produced, which come over with the bisulphide, and give the crude product its very offensive odour. These sulphur compounds are exceedingly difficult to remove from the bisulphide, which can only be purified by repeated distillations over oil, fat, and wax; or else by allowing the liquid to stand for a long while in contact with corrosive sublimate and then distilling. In coal gas certain sulphur compounds of carbon are also present, and defy all known means of isolation and identification. They are very possibly formed (as in the manufacture of carbon bisulphide) by the direct union of the sulphur vapour with the heated coal or coke.

Sulphur also unites with carbon and nitrogen when present in the combination known as cyanogen. Although cyanogen has not been formed, as yet, by the direct union of carbon and nitrogen, it is produced when an alkali is present, the result being a cyanide of the metal and carbonic oxide. Now, when ammonia gas is passed over heated charcoal, a somewhat similar reaction takes place, a cyanide of ammonia being formed, and hydrogen set free. Prussic acid or hydrogen cyanide may be formed by heating nitrogen with acetylene, a gaseous hydrocarbon given off in gas-retorts; and cyanogen gas itself is said to be formed by the action of carbonic oxide on ammonia at a high temperature. These bodies—ammonium cyanide, hydrogen cyanide, and free cyanogen—are probably produced in the retort, and, by reacting with the sulphur present, produce the bodies known as sulpho-cyanides. A common method of making potassium sulpho-cyanide is to melt together potassium cyanide and sulphur, and in a similar way ammonium sulpho-cyanide is produced by heating yellow ammonium sulphide (which contains sulphur in solution) and hydrogen cyanide.

But there are other reactions known which produce sulpho-cyanides, and which, in all probability, take place during the distillation of coal. Under certain conditions carbon bisulphide reacts with ammonium sulphide and ammonia to form sulpho-carbonate and sulpho-carbamate of ammonia, according to the following equations:—

$$\underset{\text{Ammonium Sulphide.}}{(NH_4)_2\,S} + \underset{\text{Carbon Bisulphide.}}{CS_2} = \underset{\text{Ammonium Sulpho-Carbonate.}}{(NH_4)_2\,CS_3,\ \text{or}\ \left(SC\begin{Bmatrix}SNH_4\\SNH_4\end{Bmatrix}\right)}$$

$$\underset{\text{Ammonia.}}{2\,NH_3} + \underset{\text{Carbon Bisulphide.}}{CS_2} = \underset{\text{Ammonium Sulpho-Carbamate.}}{SC\begin{Bmatrix}NH_2\\SNH_4\end{Bmatrix}}$$

These sulphur compounds are called after the analogous carbonate and carbamate, since they are formed and react in a similar manner. When heated, these bodies decompose into ammonium sulpho-cyanide and hydrogen sulphide, according to the equations:—

$$\underset{\text{Ammonium Sulpho-carbonate.}}{(NH_4)_2\,CS_3} = \underset{\text{Ammonium Sulpho-Cyanide.}}{NH_4\,CNS} + \underset{\text{Hydrogen Sulphide.}}{2\,H_2S}$$

$$\underset{\text{Ammonium Sulpho-Carbamate}}{N_2H_6\,CS_2} = \underset{\text{Ammonium Sulpho-Cyanide.}}{NH_4\,CNS} + \underset{\text{Hydrogen Sulphide.}}{H_2S}$$

That these reactions, as above written, really take place in the retorts or condensers, we have no direct proof; but it is certain that the carbon bisulphide in crude gas is taken up by the ammoniacal liquor in the form of sulpho-carbonate, and, indeed, many efforts have been made to purify the gas from bisulphide by this means, which we will refer to more fully afterwards, and this sulpho-carbonate in presence of excess of ammonia readily yields sulpho-cyanide. Of the other compounds of sulphur detected in crude coal gas, carbon oxysulphide is probably formed by the action of steam on hydrogen sulpho-cyanide or the corresponding ammonia salt:—

$$\underset{\text{Hydrogen Sulpho-Cyanide.}}{HCNS} + \underset{\text{Steam.}}{H_2O} = \underset{\text{Oxy-Sulphide.}}{COS} + \underset{\text{Ammonia.}}{NH_3}$$

A certain portion of the sulphur unites with the oxygen in the coal, forming sulphurous acid, which is largely stopped by the ammoniacal liquor, and becomes converted, on exposure to air, into ammonium sulphate.

It has been shown, by analyses of the gas taken at different times during the distillation, that the composition of the evolved gases varies greatly during the process. During the first hour or two a very rich heavy gas comes over, containing more than 10 per cent. of the light-giving hydrocarbons, classed as olefines, the diluent being chiefly marsh gas. In the latter part of the process a very light non-illuminating gas is given off, containing a considerable amount of nitrogen and carbonic oxide, while free hydrogen is much more abundant than marsh gas. It seems probable, then, that the cyanogen compounds are produced mainly towards the latter end of the distillation. The time allowed for carbonization thus causes a variation in the amount of sulphur in the gas. If the coals are thoroughly exhausted, nearly all the sulphur from the pyrites is given off, and unites with the hydrogen and carbon to form highly volatile compounds; but when the distillation is conducted, as in Paris, for four hours only, some of the sulphur remains behind, and fewer sulpho-cyanides are produced.

Whatever sulphur remains in the gas after it has undergone purification, no matter in what way or with what elements it may be combined, it produces, when it is burnt in air, only one product—sulphurous acid. It might seem, then, that, as coal gas is meant to be burnt in air, it would make little difference in what form the sulphur existed previously to being burnt. But it is nevertheless a fact that gas managers and the public with one accord denounce and proscribe sulphur in combination with hydrogen, while "sulphur other than sulphuretted hydrogen" is the subject of the most bitter debate, and constitutes, in fact, the "Sulphur Question." We must examine the evidence produced on either side, and separate, if possible, all interested contributions to the controversy, before we can arrive at a sound judgment. But, as a preliminary, it will be necessary to review the various methods which have been employed to effect the purification of the gas.

(*To be continued.*)

CHAGFORD WATER SUPPLY.—Last Thursday, the works for the supply of water to Chagford were opened in the presence of Mr. Ellis, the Engineer, the Members of the Committee, and others. The Rev. H. G. Hayter-Hames, Chairman of the Okehampton Sanitary Authority, turned on the water at the filter-beds, the reservoir being entirely full, and containing 40,000 gallons—a supply sufficient for four days consumption. The cost of the works will be about £700.

DROWNED IN A GASHOLDER-TANK.—On Saturday evening, Sept. 20, an inquest was held at Hove touching the death of James Heathfield, a labourer, who met his death on the previous day under the following circumstances. Deceased was, on Friday afternoon, about three o'clock, engaged working at a new gasholder in course of construction at the gas-works, Hove. He was labouring for a man named Foster, who was engaged rivetting in the interior of the gasholder. The deceased had occasion to go for a number of washers and bolts which Foster required, and when returning with these he had to cross from one side of the gas-holder to the place where Foster was working on a raft. The tank contained a large quantity of water, the depth in one place being 16 feet, and in another 32 feet. Whilst working himself across, the raft slipped from under him, and precipitated him into the water at the point where it was least deep. Foster at once gave the alarm, and a man named Wilks entered the holder and attempted to rescue Heathfield by diving into the water. He failed to find him, however, and other means were then resorted to in order to save the poor fellow, but it was not until they had dragged the place for two hours that his body was recovered from the deepest part of the tank, when, of course, life was extinct. After hearing evidence in support of these facts, the jury returned a verdict of "Accidentally drowned."

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. HUTCHINSON ON "THE ESTIMATION OF SULPHUR COMPOUNDS."

SIR,—In your notice of my paper read at the last meeting of the Manchester District Institution of Gas Engineers, you state that I think "no other compounds than carbon bisulphide are determined by the combustion of gas." Now, as I do not think so, and am not aware that it is so stated in the paper, I shall be glad if you will correct this. I believe, with yourself, that the whole of the sulphur, in whatever form, is consumed.

In comparing the results of the various apparatus, you misunderstand me when you suppose the whole series of tests were made from the same stock of gas. They were not; but when one simultaneous test with the various apparatus had been made—say No. 1—the holder was filled afresh from the town mains for No. 2, and so on, the quality not being exactly the same, although nearly so.

Gas Offices, Barnsley, Sept. 22, 1879. W. W. HUTCHINSON.

STEAM-BOILERS.

SIR,—If "A Lover of Gas-Engines" will blow out part of the contents of his steam-boiler every day (for merely a few minutes) instead of doing so only once a week, he will—taking it for granted that his mud, or blow-off pipe really reaches very near to the bottom of the boiler—effectually get rid of the loud thumping noise which justly annoys him. His feed water, although soft and leaving scarcely any incrustation on the boiler, is undoubtedly rather turbid, and very likely deposits a lot of mud at the bottom of the boiler, thus occasioning the "small explosions" of which "A Lover of Gas-Engines" complains.

London, Sept. 26, 1879. CIVIS.

Legal Intelligence.

YORK (EAST RIDING) PETTY SESSIONS.—SATURDAY, SEPT. 27.

(Before Mr. W. H. R. READ *and a Bench of Magistrates.)*

OBSTRUCTIONS DURING MAIN-LAYING.

The York New Water-Works Company were summoned for wilfully obstructing the free passage of a certain highway by making an excavation on the same.

Inspector FARRAH appeared in support of the information; and Mr. J. P. WOOD, Solicitor, on behalf of the Company.

P.C. *Bramley* was called, and stated that on the night of the 5th of September, about nine o'clock, he was passing through Fulford, and noticed a trench dug across the road. In consequence of it, vehicles passing had to turn out of the way. There was another trench on the east side, about 30 yards in length. Witness spoke to a watchman, who was in the middle of the road, about 35 yards from the hole. There was a light near the cross trench. On the night in question he heard that an accident had happened, a wheel of a trap having got into one of the holes, after which the hole was filled up.

The CHAIRMAN said he thought that an obstruction of the highway had been permitted, and, owing to the insufficiency of light, the horse and trap appeared to have been driven into the hole.

Mr. WOOD submitted that there was room enough to pass without such an accident happening.

A MAGISTRATE said that in London, besides the lamps, such holes would be lighted on either side.

The CHAIRMAN thought that if there was a hole in the road, and a cart-wheel got into it, there being no watchman near enough to prevent the accident, it was clearly a case of obstruction.

Mr. WOOD said he could show that a traveller with a heavy conveyance had passed the place sixteen times during the day and night, and never met with an accident. Complaints had been made to the Company that in the winter, owing to the pipes in the locality referred to not being deep enough, the water became frozen, and the Company had been asked to lower them before the winter arrived. The trench in question was formed to carry out the necessary improvements. This class of works could not be performed without some little inconvenience to the public; and the question was whether they had not used reasonable care. Whilst submitting that they had, the Directors would be glad to consider any suggestion which the Magistrates might wish to make. He believed that no damage or injury resulted from the accident, and no complaint was made afterwards concerning it.

A carrier named *Lancaster* stated that on the night in question he was driving a party of boys towards Escrick. On approaching Fulford he observed something dark on the road, and after driving very quietly for a short distance farther, one of the wheels of the conveyance got into a hole. He had turned to the left to avoid the light.

Mr. WOOD said the road was wide enough, and turning to the left would cause the accident.

In answer to Inspector FARRAH, *witness* said he drove on the proper side of the road. A second conveyance was approaching by the same way, but he stopped it.

Mr. WOOD said that the road being very wide, it was thought that one light, with a watchman stationed on the spot, would be sufficient to ensure safety. The accident seemed to have happened from the man not driving straight on.

The BENCH, in the result, concluded that a case of obstruction had been made out. There ought to have been a light on both sides of the road. They did not think, however, that any blame attached to the Company, but to their servant, whose place it was to warn drivers approaching of the danger.

Mr. WOOD said he understood that the watchman shouted on the driver of the conveyance approaching.

The witness *Lancaster* said he never heard a voice, and the night was very still.

The BENCH thought they would not be doing justice to the public if they did not fine the defendants, and the penalty imposed was 20s., and 18s. 6d. costs.

WASTE OF WATER AT EXETER.—At the meeting of the Exeter Town Council last Wednesday, the Surveyor (Mr. H. P. Boulnois) stated that, owing to the enormous waste of water at present, the Water Committee could not give a constant supply, which, as the rate used, would need 3 million gallons per day; whereas the pumping apparatus they possessed would only raise 1,200,000 gallons.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

THE AMALGAMATION OF THE SOUTH METROPOLITAN AND SURREY CONSUMERS GAS COMPANIES.—At the meeting of the Metropolitan Board of Works on Friday last, it was reported that a letter had been received from the Board of Trade, transmitting a copy of the scheme for the amalgamation of the South Metropolitan and the Surrey Consumers Gas Companies, as finally settled; and a further letter from the Board of Trade, stating that they did not think it necessary to insert in the scheme the clause suggested by the St. Olave's District Board of Works relative to lighting the public lamps. A copy of the latter letter was ordered to be sent to the St. Olave's Board.

AUSTRALIAN GASLIGHT COMPANY, SYDNEY, NEW SOUTH WALES.

The report of the Directors of this Company for the six months ending June 30 last (the 87th half year) stated that the profits, after deducting for bad debts, interest on borrowed money, cost of repairs and renewals of plant, working expenses, and all charges, amounted, with the balance brought forward (£2314 14s. 7d.), to £23,667 18s. 1d. The Directors recommended a dividend for the half year of 7½ per cent.—£18,740 9s. 6d., which would leave a surplus of £4927 8s. 7d.; out of which it was proposed to transfer to the reserve-fund £4000, leaving a balance to carry forward of £927 8s. 7d. The reserve-fund would then stand at £29,061 9s. 9d., from which the Directors intended, during this half year, to write off £9061 9s. 9d. for depreciation of plant, leaving the reserve at £20,000. The large tank and gasholder at the Haymarket station were in full use, and were found to work satisfactorily. The storeage of gas was ample for all present purposes, and for meeting increased demands for some time to come. Provision was being made for increasing the distributing power also, by taking up mains in several localities and replacing them with others of larger size.

The following is the

Revenue Account, for the Half Year ended June 30, 1879.

Manufacture, distribution of gas, and management . .	£26,056	5 11	Sales of gas, &c.	£53,746	15 0
Lighting and repairing public street-lamps	1,773	18 11			
Miscellaneous charges—interest, bad debts, &c. . . .	4,563	6 8			
Profit	21,353	3 6			
	£53,746	15 0		£53,746	15 0

Net Revenue.

Dividend payable Feb. 5, 1879	£18,555	18 7	Balance at Dec. 31, 1878 . .	£26,870	13 2
Reserve-fund	6,090	0 0	Profit brought down . . .	21,353	3 6
Balance to next account . .	23,667	18 1			
	£48,223	16 8		£48,223	16 8

Liabilities and Assets, June 30, 1879.

Sundry creditors — temporary loans	£109,782	18 4	Fixed investment: — Land, buildings, and machinery at head station and the four out-stations (Haymarket, Woolloomooloo, Balmain, and Petersham); main and service pipes laid; implements and furniture	£334,456	8 0
Suspense accounts . . .	934	13 0			
Capital paid up	249,873	0 0			
Reserve-fund	25,061	9 9			
Reserve for replacement of meters	4,504	15 6	Floating investment:—Coals, residual products, apparatus in store, meters, lamps and pillars . . .	57,899	4 11
Dividends unclaimed . .	1,559	8 10	Sundry debtors	21,622	11 1
Unappropriated profits . .	23,667	18 1	Suspense accounts . . .	1,172	13 5
			Cash.	233	6 1
	£415,384	3 6		£415,384	3 6

The Directors of the Company are Messrs. M. Metcalfe (Chairman), R. G. Reading (Deputy-Chairman), R. Jones, W. B. Walford, C. H. Myles, L. W. Levy, J. Paxton, S. Dickinson, S. D. Gordon, J. G. Ross, J. R. Fairfax, and Sir G. W. Allen. The Secretary and Trustee is Rev. R. Mansfield; and the Engineer is Mr. Thomas James Bush.

THE CLONMEL GAS COMPANY AND THE CORPORATION.

THE PUBLIC LIGHTING OF THE TOWN.

A Special Meeting of the Clonmel Town Council was held on Thursday, the 18th inst.—the MAYOR (Alderman Hackett, J.P.) in the chair—for the purpose of considering an amended tender from the Gas Company for the lighting of the public lamps. This question has been for some time in dispute between the Corporation and the Company, the terms proposed by the latter being considerably higher than those fixed by the Corporation, and it was intended, in the event of the two bodies not coming to an agreement, to resort to the use of oil for public lighting.

The TOWN CLERK (Mr. Luther) read the following letter from Mr. W. Davis, the Secretary of the Gas Company:—

Clonmel Gas Consumers Company, Sept. 13, 1879.

Gentlemen,—I have to acknowledge receipt of two letters from Mr. John T. Luther, under date the 6th and 12th inst. Both have been duly considered at a meeting of our Board of Directors this day. In reply to that of the 12th inst., I am to state that this Company have always considered it right to supply gas to the public lamps on fair terms, and as low as circumstances admit. They are now determined to make such a tender as they think right to remove all just cause of complaint, and that at a sacrifice. I am, therefore, authorized to offer to light all the public lamps for the year ending the 30th of August, 1880, for the sum of £500—the lighting being precisely similar to that given and provided for in the last contract. Monthly payments as before. And in reply to Mr. Luther's letter of the 6th inst., I am to say that in the event of this tender not being accepted, the Company are ready to entertain an offer for all the lamp-posts, brackets, and lanterns now in use.

To the Mayor and Corporation. (Signed) WM. DAVIS, Secretary.

Alderman CANTWELL proposed the following resolution:—"That the Streets and Finance Committee be empowered to treat with the Gas Company for the lighting of the public lamps of the borough for twelve months, from Sept. 1, 1879, to Aug. 31, 1880, at a sum not exceeding £450, the number of lamps lighted to be the same as under last contract." In doing so, he said the Committee had gone very minutely into all the calculations before them, and were of opinion that the Company's offer should be accepted if they would agree to the sum of £450.

Mr. STEEDY seconded the resolution, which, after considerable discussion, was carried unanimously.

Alderman MURPHY remarked that it would be necessary for the Corporation to introduce a clause in the contract with the Company, specifying that the standard quality of the gas should be 16 candles.

Alderman CANTWELL said it would be better to leave the matter in the hands of the Committee and the Company, who, they would find, would give very good light for the next twelve months.

The Council then adjourned.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Albion Tavern, Aldersgate Street, on Thursday, the 25th inst.—Professor ERASMUS WILSON, F.R.S., in the chair.

The SECRETARY (Mr. Magnus Ohren, Assoc. M. Inst. C.E.) having read the notice convening the meeting, the following report and accounts were submitted:—

The Directors report that the general working of the Company during the half year has been satisfactory.

The new gasholder is now completed, and has been brought into use.

The Bill reported as before Parliament at the last meeting has received the Royal Assent.

The reports of the Gas Examiners of the parishes supplied by the Company, as to the illuminating power of the gas and its freedom from sulphuretted hydrogen and ammonia, continue to be satisfactory.

The Directors recommend that an addition of £20 per annum be made to the remuneration of each Auditor, in consideration of the increased labour thrown on those Officers.

The accounts annexed show the financial position of the Company. The balance of profit and loss account amounts to £11,745 3s. 10d. Out of this sum the Directors recommend the declaration of a dividend for the half year ending the 30th of June last at the following rates per annum—viz., 6 per cent. on the preference stock; 7 per cent. on the ordinary 7 per cent. stock; 10 per cent. on the ordinary 10 per cent. stock; and 7 per cent. on the new ordinary 7 per cent. shares; all less income-tax. This will absorb £10,452 12s. 1d., and leave £1293 11s. 9d. to be carried forward to the profit of the succeeding half year.

[The paid-up capital of the Company consists of £50,000 of 6 per cent. preference stock; £125,000 of ordinary 7 per cent. stock; £75,000 of ordinary 10 per cent. stock; and £30,000 of new ordinary 7 per cent. shares. There is £120,000 more of the last description of capital, and £37,500 of loans authorized to be raised by the Company's last Act of Parliament. The total expenditure on capital account to June 30 was £266,145 8s. 5d., a net addition of £4049 6s. 6d. having been made to it since December. The contingent-fund amounts to £10,000; the reserve-fund, to £15,150; and the insurance-fund, to £2370. Of these amounts, £23,000 is invested in Government and other funds.]

Dr. REVENUE ACCOUNT, *for the Half Year ended June 30, 1879.* Cr.

To Manufacture of gas—					**By Sale of gas—**			
Coals, including all expenses			£20,397	2 10	Lady-day quarter—			
Purifying materials, wages, &c.			1,014	10 10	Private rental—			
Salaries of Engineer and Officers			585	0 0	3,949,600 cubic feet, at 3s. 7d.	£707	12 9	
Wages and gratuities			3,292	18 1	125,757,600 ,, 3s. 9d.	23,579	11 0	
Works, machines, and retorts—maintenance of, repairs, and labour	£4,248	11 10					£24,287	3 9
Less old material	2	17 4			Midsummer quarter—			
	£4,245	14 6			Private rental—			
			£29,535	6 3	2,375,800 cubic feet, at 3s. 7d.	£407	15 3	
Distribution of gas—					62,664,800 ,, 3s. 9d.	11,749	10 10	
Salaries of Chief Inspector, Inspectors, and Clerks in Light Office	£717	5 1					12,157	6 1
Mains and service-pipes, repairs, maintenance, renewal, and labour	1,037	19 5			194,647,600 private rental, the half year		£36,444	9 10
Meters, regulators, and gas-stoves, repairing and renewing	1,231	19 4			14,846,660 public rental, the half year, on 1781 lamps		3,804	7 0
			2,987	3 10	Total 209,494,260 cubic feet sold		£40,248	16 10
Public lamps—					Rental of meters		623	11 10
Lighting and repairing			721	8 6	Total rental		£40,872	8 8
Rents, rates, and taxes—					**Residual products—**			
Rents	£22	13 6			Coke, less labour and cartage	£8,062	17 8	
Rates and taxes	1,442	18 9			Breeze ,, ,,	218	16 4	
			1,465	12 3	Tar	983	2 3	
Management—					Sundries	4	15 7	
Directors allowances	£750	0 0				£9,269	11 10	
Salaries of Secretary, Accountant, Clerks, and Messenger	564	2 8			Sulphate and ammoniacal liquor, less labour, &c.	2,494	18 6	
Collectors commission	903	17 7					11,764	10 4
Stationery and printing	275	5 1			Rents		95	19 6
General establishment charges	350	17 8						
Auditors	30	0 0						
			2,874	3 0				
Sundries—								
Law and parliamentary charges			1,107	12 4				
Bad debts and allowances			281	4 0				
Insurance-fund			202	10 6				
Horses and carts			152	0 0				
Total expenditure			£39,307	0 8				
Balance carried to profit and loss account			13,425	17 10				
			£52,732	18 6	Total receipts		£52,732	18 6

PROFIT AND LOSS ACCOUNT (NET REVENUE).

To Reserved fund account, amount carried from the half year's profits			£3,000	0 0	By Balance of net profit from last account	£11,621	18 6	
Balance of net profit to be carried to next account, subject to half year's dividends to the 30th of June			11,745	3 10	Less dividend paid for the half year ended the 31st of December	10,452	12 1	
							£1,169	6 5
					Balance from revenue account, being profit for the half year		13,425	17 10
					Interest on contingent-fund, &c.		149	19 7
			£14,745	3 10			£14,745	3 10

The CHAIRMAN, in moving the adoption of the report and accounts, said if there were any strict economist among the Shareholders (and it was to be hoped that they were all economists in one way—that of obtaining the best they could for their money), he thought he might propose, upon the present occasion, that they should stereotype the Directors report, inasmuch as it had been his duty and pleasure for a number of years to go over exactly the same ground, and say that they were doing well, and that everything was progressing satisfactorily. They did not profess much brilliancy; they did not lay themselves out for the electric light—quite the contrary; they preferred a steady, industrious, honest, working course of life, and to receive their reward at the end of the half year in the manner in which they had been enabled to do for some years past. They had no exciting matter either to give a polish or a brilliancy to his (the Chairman's) speech at the present moment. As to the pretty experiment in electricity, which cost so much in the way of advertisement a few years ago, one naturally inquired, when a thing was praised up to the sky by the skilful penmanship of editors, how much does it cost, and who pays for it? The world, however, was addressing itself now in a different direction; it was listening to the impetus of sound, and, instead of being illumined by electricity—having their eyes put out and Heaven knew what besides—they were going to communicate in whispers with friends at the other end of the world. He sincerely trusted that this experiment would be more successful than the previous 'one. His only objection to it would be that it might possibly interfere with their very dear and excellent friend and officer, Mr. Glaisher, because if the telephone was to be used for the purpose of keeping up a communication between the moon and the earth, his (Mr. Glaisher's) avocation would cease—he would have nothing more to explore. As, however, they had no longer any anxiety in either of these two directions, they would address themselves to the business which was immediately before them. The Directors report had, he had no doubt, been in the hands of all present. They would hear that the general working of the Company had been, as usual, most satisfactory, and that the large gasholder they spoke of at their last meeting had been completed, and it had now been brought into use. It was like opening a new warehouse, in consequence of the extension of their business requiring more ware room for their wares; and they could not have a better indication of success than such a necessity as that implied. The Bill which was reported as being before Parliament at their last meeting had now been carried in their favour, giving them opportunities which might or might not be required, but nevertheless which it was very desirable that the Company, for their own protection and defence, should have within their reach. The next paragraph was one which was also an indication of their successful progress. It suggested—and he had no doubt that the resolution would be approved of by the Shareholders—the increase of the amount which had been allotted up to that time to the Auditors. They had considerably more labour thrown on their hands at the present moment, and the Directors thought that the time had come, even exercising the greatest economy, when a little addition should be made to the cheque drawn for the Auditors at the end of each half year. With these few observations, and calling their attention to the balance-sheet, which was too extensive to be gone through other than in their own easy-chairs at home, he would conclude by moving—"That the report of the Directors and the balance-sheet, confirmed by the Auditors, be received, adopted, and entered upon the minutes."

Mr. C. LEA WILSON, J.P., D.L., seconded the resolution.

Mr. R. H. JONES, J.P., was sorry to hear one remark from the Chairman—that they did not profess much brilliancy. Having gone into the district to reside, he thought the Chairman had made a mistake, because the Company supplied a very brilliant light. As to the working of the Company, he noticed that there were 9000 cubic feet of gas sold per ton of coal used, which was a very good result. He also noticed that their fuel account was remarkably low—only 12 per cent., which he thought stood A 1 as a fuel account in gas companies. Again, as to their residual products, they had sold no less than 57 per cent. on the cost of the coal; and the result of the sales of ammonia was very good, producing one ton of sulphate of ammonia for every 121 tons of coal used. They had also the grand fact, that they had added £3000 to their reserve-fund, and carried a balance forward £121 in excess of the amount carried forward last time.

The resolution was put, and carried unanimously.

The DEPUTY-CHAIRMAN (Mr. H. P. Stephenson) then moved—"That a dividend for the half year ending the 30th of June last be now declared, and be made payable forthwith, at the following rates per annum—viz., 6 per cent. on the preference stock, 7 per cent. on the ordinary 7 per cent. stock, 10 per cent. on the ordinary 10 per cent. stock, and 7 per cent. on the new ordinary 7 per cent. shares, all less income-tax."

Dr. FREDERIC HETLEY, J.P., seconded the motion, and it was carried unanimously.

The CHAIRMAN moved—"That an addition of £20 per annum be made to the remuneration of each Auditor."

Mr. CURTIS seconded the motion, which was supported by

Mr. GEORGE LIVESEY, who pointed out that in the case of this Company, unlike the Metropolitan Companies, the whole of the responsibility as to the accounts rested with the Company's Auditors.

The motion was carried unanimously.

Mr. A. LAYTON expressed the thanks of his colleague and himself for this spontaneous act. They did their very best to put the accounts before the Shareholders in the most correct and intelligible shape. They paid a great deal of attention to vouching all items, acting, in so doing, in their own interests, as well as the interests of the Shareholders, and of the Directors and Officers of the Company. The acknowledgment of their services which had just been made would prompt them to continue their

labours as before. As the Shareholders were aware, the work of the Auditors had very much increased by the increase of the capital and of the district.

Mr. A. Williams moved a vote of thanks to the Chairman and Directors for the able manner in which they had conducted the affairs of the Company. He was very pleased that, from the commencement of the Company, their affairs had been governed by such gentlemen as those now constituting the Board, and who had carried them from one point to another till they had arrived at the happy position of being able to put by and add to their reserve-fund, besides paying the maximum dividends.

Mr. Webster seconded the motion, which was carried unanimously.

The Chairman having briefly acknowledged the compliment,

Mr. H. P. Stephenson said they had a set of officers whom they could trust, and to whom they could look with confidence to carry on the operations of the Company. He proposed a vote of thanks to the Auditors and other Officers, especially the Engineer (Mr. Gandon) and the Secretary (Mr. Magnus Ohren).

Mr. W. H. Bennett seconded the motion, which was carried unanimously.

Mr. Glaisher, F.R.S., returned thanks, and in doing so said that, so far as he could see, the Officers vied with each other to make the Company a success. With respect to the Auditors, he could only reiterate the observation of his colleague, that they had done their best, and the recognition just bestowed on their labours would stimulate them to a continuance of their efforts on behalf of the Company.

The meeting then separated.

HARROW DISTRICT GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held at the Guildhall Tavern, London, on Wednesday, the 24th inst.—James Glaisher, Esq., F.R.S., in the chair.

The Secretary and Engineer (Mr. J. L. Chapman) having read the notice convening the meeting, the following report and accounts were presented:—

The Directors, in submitting the accompanying statement of accounts to the Proprietors, are enabled to report that the same steady progress in the position of the Company continues.

There is an increase in the gas-rental, as compared with the corresponding period of last year, of £175. The residuals have also increased in value by £56. This is chiefly owing to the manufacture of sulphate of ammonia, for which purpose works have lately been erected.

The balance of the profit and loss account is £1151 16s. 5d. The Directors recommend that a dividend at the rate of 6 per cent. per annum (free of income-tax) be paid, and that £200 be written off the parliamentary expenses, leaving a balance of £17 2s. 2d. to be carried forward to the next account.

[The total authorized capital of the Company is £56,250—viz., £30,000 entitled to 10 per cent.; £15,000 of 7 per cent. shares; and £11,250 of loans. The whole of the 10 per cent. shares are paid up, and half the loans; while there still remain £13,500 of the 7 per cent. capital to be issued. The expenditure on capital account during last half year was £378 6s. 7d.; making a total, to date of account, of £37,015 14s. 3d.]

Dr. *Revenue Account, for the Half Year ended June* 30, 1879. Cr.

Manufacture of gas—				Sale of gas—		
Coals, including all expenses	£1156	10	6	Lady-day quarter—		
Purifying materials, water, oil, &c.	34	18	0	Private rental—		
Salary of Engineer	125	0	0	5,645,200 cubic feet at 6s.	£1693	7	1
Wages	211	19	0	619,300 cubic feet at 6s. 3d.	231	13	9
Works, machines, and apparatus—maintenance of, repairs, and labour	193	16	10	Public rental and under contracts	160	9	6
Distribution of gas—				Midsummer quarter—			
Mains and service-pipes, repairs, maintenance, renewal, and labour	45	16	11	Private rental—			
Meters, renewing, repairing, and refixing	10	15	4	2,451,988 cubic feet at 6s.	735	5	9
Public lamps—				301,700 cubic feet at 6s. 3d.	94	5	7
Lighting	26	16	0	Public rental and under contracts	55	16	6
Rents, rates, and taxes—				Meter-rental, the half year	74	19	9
Rents	16	8	0	Residual products—			
Rates and taxes	91	8	0	Coke, less labour and cartage	353	6	3
Management—				Tar, do., do.	60	1	7
Directors and Auditors allowances	150	0	0	Sulphate of ammonia	82	18	5
Salary of Secretary	25	0	0	Transfer fees	0	6	0
Collector's commission	39	0	0				
Stationery and printing	15	17	3				
General establishment charges	81	19	9				
Sundries—							
Bad debts	5	17	3				
Total expenditure	£2222	2	10				
Balance carried to profit and loss account	1320	7	4				
	£3542	10	2		£3542	10	2

The Chairman, in moving the adoption of the report, said it would be evident from it that the observations he had to make need only be few. It would be observed first that, after the introduction, there was no remark made about the illuminating power of the Company's gas, and this arose from the fact that in the half year no official examination had been made or ordered by the Local Authorities, from which circumstance he inferred that those Authorities were quite satisfied with the article with which they had been supplied. As, however, he had often told them, the illuminating power of the gas, taken day by day, was sent to him, and therefore he was in the position at all times of knowing what was the quality of the article they were supplying; and he might state that since they last met there had been few occasions on which the illuminating power had been little above 16 candles. As they were aware, it had before been 17, and he thought their Manager had been a little too generous. Last year, however, he had been very watchful, and only on a few occasions had the illuminating power exceeded 16 candles; but it had generally been 15½, and he did not think there had been more than one occasion on which it had been 15. He was, therefore, exceedingly pleased to have the opportunity of publicly thanking their Engineer for his watchful care that the illuminating power of the gas should never go so low as to give cause of complaint—on the one hand, from the consumers, and on the other hand from the Chairman. The next paragraph was one that they might have taken almost in any year. It related to the extension of the business, and stated that the increase in the gas-rental, as compared with the corresponding period of last year, was £175. If he looked at the gas-rental four years ago, he found it was £2410; then £2580; then £2710; then £2870, and in the past half year it was £3046. This showed, as he had before pointed out, that there was a slow but steady increase, and the increase of £176 last half year was a little above the average. There was no doubt whatever that they would have a continuation of what had happened for several years—a continuation of just about the same increase, until they had some external influences exercised on the town of Harrow. Harrow in itself was not a manufacturing town; there was no increase of the population. They would recollect that three or four years ago he had mentioned that there was a probability that another railway would be made from London to Harrow; he mentioned it a second and a third time, and then he mentioned it almost in a whisper, scarcely believing it would come, and at one or two of their meetings he did not mention it at all. However, he was in Harrow on Monday, and saw girders thrown over the North-Western line; a little further on, a bridge, and other indications of progress, a great many men being employed on the works; and he thought it was not improbable that next year he might mention the railway as a fact, and as a fact which would exercise a great influence on the interests of the Company. The terrible thing they had to contend with at Harrow was that the amount of coal obtainable in London for 20s. cost the Company more than 30s.—they had to pay at Harrow for coals more than half as much again as what was paid in London; and directly the railway was open—and they had already had some correspondence with the Manager—whatever reduction could be made in the price of coal would enable them to reduce the 6s. per 1000 charged for gas, thus giving to the consumer the full benefit of the reduction in the price of coal which they might have directly the railway was open, and they obtained carrying powers. The absence of this advantage was a very serious matter for the Company at present, and caused them a great deal of expense. Now, however, as he had intimated, they would get their coals much cheaper; and there was no doubt that an increase would take place in the population of Harrow as soon as there was a ready means of getting to the town. At present it was a half-a-crown fare to the town from the existing station of the North-Western Railway, and so this beautiful neighbourhood remained almost virgin country for a suburb of London. They looked forward with some confidence that the Company would derive considerable benefit from the opening of a railway station in Harrow, and it was now a thing that would be done, for it was in active progress. He had before referred to the difficulty they had had as to their ammoniacal liquor, but that no longer existed. They had a very good return from their sulphate of ammonia, and they looked forward confidently to having a ready sale for all the sulphate they would be able to make. He did not know that there was anything further for him to say, as they were going on so uniformly. There was constantly a small increase in their business; and, no doubt, this was the normal state of matters with them. Their plant was in excellent condition, and, at a small outlay of capital, they could double their business, if the business would come to them. So, whatever view they took of the Company, it seemed to be in an excellent condition.

The Deputy-Chairman (Mr. John Chapman), in seconding the motion, said he quite agreed with what the Chairman had stated as to the probability—and almost positive fact—of a new railway coming to Harrow. They knew that Willesden was now filled up; that was the last adjoining suburb to London, and the houses there were to be counted by hundreds, and almost thousands. The next place to come to was Harrow, and with a Metropolitan connection he thought they might confidently look forward to the same increase. Around the present station of the North-Western Railway Company at Harrow the houses had fast increased, and the Hendon Board had expended between £6000 and £7000 on drainage. They would have a large increase of the population there, and consequently a great many more consumers. They were also preparing to lay out a system of drainage at Wembley and Alperton, and with a good gas and water supply they would have a large increase in the number of gas consumers in both those districts. With the prospect of obtaining their coals cheaper, and getting an increase in their consumers, a state of things would be brought about which, no doubt, they all desired to see.

The motion was put, and carried unanimously.

The Chairman said there remained one very pleasant duty. For a good many years they were fighting against difficulties, and they could not get up to what was mentioned in their prospectus—6 per cent. dividend. They had, however, at length done so, and that had been maintained.

Mr. J. Randall: I should like to see 7 per cent.

The Chairman remarked that he would like to see 10 per cent.

Mr. Randall: My ambition does not come up to that.

The Chairman said as they went on increasing from 6 to 7, and 8 to 9, he thought it probable that Mr. Randall's ambition would follow them. He then moved the payment of a dividend at the rate of 6 per cent. per annum, free of income-tax, and that £200 be written off the parliamentary expenses. They were steadily reducing the parliamentary expenses. It would be the wisest thing to write those off as soon as they could, and so reduce their capital.

Mr. A. Baynes, in seconding the motion, observed that while he quite acquiesced in the remark that fell from Mr. Randall, he thought the Shareholders had to congratulate themselves that they were receiving 6 per cent. dividend. Those who were interested in other undertakings had had to put up with something extremely moderate. He held that they were to be congratulated on maintaining their dividend at 6 per cent., and in being still able to diminish the parliamentary expenses. They were not a changing constituency, and, as they were improving their property, those of them who had children would receive something by way of deferred interest hereafter. He was sure that the whole commercial history of the country showed the prudence of not dividing everything up to the hilt, and while they felt that the dividend could be increased in the future, the Board were thoroughly united in thinking that they were considering the Shareholders interests and the stability of the Company in maintaining it at 6 per cent. for the present.

The motion was put, and carried unanimously.

The Chairman then referred to the efforts of the Officers, and all connected with the Company, in promoting its welfare. The dividend could not have been earned without the best exertions of the Engineer, whose conduct of the works he warmly eulogized. He moved a vote of thanks to him, observing that such a recognition would act as a stimulus, not to increased exertions, but to a continuance of them.

Mr. C. Horsley, C.E., in seconding the motion, said the Engineer had shown that he was fully alive to the interests of the Company, and did his work very much to the satisfaction of the Works Committee and of the Board.

The motion was carried unanimously.

Mr. J. L. Chapman, in acknowledging the vote, said he was interested in doing the best he could for everything he undertook, and it was gratifying to see how satisfactorily their work went on. Harrow was a suburban town, without a greatly increasing population, and without a good railway, and yet they had never gone down in their sales of gas or their dividends. The difficulty at Harrow was the cartage of everything they wanted from a distance of 2¼ miles. The expenses, for instance, of the cartage, loading, and unloading of the 3000 tons of coal they used annually at the works amounted to about 3s. per ton; but this difficulty would be greatly ameliorated when the new railway station brought their coals within half a mile of the gas-works. The works were kept in an excellent condition, and he hoped before very few years were over that Mr. Randall would have his wish.

Mr. Horsley remarked that if they were situated as they were at Tottenham they could now pay a dividend at the rate of 9 per cent. per annum—that was to say, the extra cartage they had at Harrow was equal to a dividend of 3 per cent.

The Chairman moved a vote of thanks to the Auditors, which was seconded by Mr. T. C. Hudson, and carried unanimously.

Mr. J. Randall, in reply, said it was a pleasure to himself and his colleague to audit the accounts of the Company. They would like to see the coke sales come out better, but the Secretary informed them he had very keen competition to contend against. He (Mr. Randell) then moved a vote of thanks to the Chairman and Directors for their attention to the business of the Company during the half year.

Mr. G. Randall seconded the motion, and it was carried unanimously.

The Chairman, in reply, said that the Company was a pet child of all the Directors, who took considerable pride in it. They would spare no effort to make it a great success, and he could assure them that their past exertions would be, he did not say increased, but would be continued.

The proceedings then terminated.

SHREWSBURY GASLIGHT COMPANY.

The Annual General Meeting of this Company was held last Thursday—Mr. A. G. Brookes in the chair—when the following report of the Directors was presented:—

The Directors herewith submit to the Proprietors the annual statement of accounts for the year ending June 30, 1879, which shows that the affairs of the Company are in a prosperous condition, and they recommend that the authorized dividend be declared.

The works in progress at the date of your last meeting have been completed, and are now doing satisfactory duty. The Directors do not contemplate any further extensions during the current year.

£1811 12s. 2d. of capital have been expended, for which the Directors have had to draw upon the banking account, as well as for a portion of current working expenses. In consequence of the investment of the whole of the reserve-fund, and not having available working capital, considerable expense is incurred in Bankers interest. To obviate this expense in the future, and to make up the overdraft on the capital account, the Directors intend shortly to offer for sale, under the provisions of the Shrewsbury Gas Act, 1878, a further portion of the stock authorized by the resolution of the Shareholders at an extraordinary meeting held on May 16, 1878.

The results of the last year's working have been favourable, and the Directors have determined to reduce the price of gas to an uniform rate of 3s. per 1000 cubic feet to all consumers, and to reduce the charge for public lamps from 66s. to 60s. per lamp per annum. These reductions will take effect from Oct. 1, 1879.

Dr. Calvert was elected a Director to fill the vacancy occasioned by the resignation of Dr. Johnson.

Mr. S. B. Darwin, who has filled the position of Secretary and Manager during the past 13 years, having accepted a similar appointment at Portsmouth, Mr. W. Belton has been appointed to these offices.

Three of your Directors retire by rotation at this meeting—viz., Mr. Leake, Mr. Bentley, and Dr. Calvert, all of whom are eligible for re-election. One Auditor, Mr. Wade, also retires, but offers himself for re-election.

[The Company are authorized to raise £80,000 of 7½ per cent. stock; and £16,000 of loans. They have issued £43,500 of stock, the net premiums on the sale of which amounted to £2004 1s.; and have borrowed £8500 at 4, 4½, and 4½ per cent. The total expenditure on capital account to Midsummer was £55,815 13s. 2d., £7577 3s. 3d. of which was added during the preceding twelve months. The balance of profit and loss account—after meeting interest on loans, and the interim dividend paid in March last—is £5488 9s. 2d. The reserve-fund amounts to £4539 12s. 9d.]

Dr. *Revenue Account, for the Year ending June 30, 1879.* Cr.

Manufacture of gas—				Sales of gas at 3s. 9d., 3s. 8d., 3s. 7d., 3s. 6d., 3s. 4d., 3s. 3d., and 3s. per 1000 cubic feet, up to Sept. 30, 1878, and 3s. 4d., 3s. 2d., and 3s. since				
Coals, including carriage, unloading, and all expenses	£5,421	2	5		£11,435	9	7½	
Purifying material and labour	283	3	1½	Public lighting and under contracts, including lighting, extinguishing, removals, and repairs	1,460	18	6	
Salaries of Engineer and Officer at works	212	10	0	Rental of meters	370	4	10	
Wages, carbonizing	1,018	13	7½	Residual products—				
Repairs and maintenance of works, plant, &c.	2,101	11	0½	Coke £1,537 16 11½				
Distribution of gas—				Less labour and cartage 240 5 1½				
Salaries of Inspector and Clerks in Light Office	189	16	3		1,297	11	10	
Repairs, maintenance, and renewals of mains, services, and meters	530	15	0	Tar	1,022	14	6½	
Public lamps—				Ammoniacal liquor	628	3	10	
Lighting and repairing	362	0	11½	Fittings	1,405	13	10	
Rates and taxes	468	1	9	Rents	32	13	9	
Management—				Purifying materials, lime, and sundries sold	363	9	7	
Directors allowance	175	0	0	Discounts, &c.	129	4	3	
Auditors	21	0	0					
Salaries of Secretary and Clerks	341	8	5½					
Collector's salary	120	0	0					
Stationery and printing	131	15	7½					
General charges and incidentals	100	9	5					
Insurances	18	19	6					
Fittings	1,350	1	1½					
Bad debts	93	16	2½					
Bankers commission and interest	90	19	8					
	£13,031	4	2					
Balance	5,115	0	5					
	£18,146	4	7		£18,146	4	7	

The Chairman moved—"That the report of the Directors, together with the statement of accounts as certified by the Company's Auditors, be approved and adopted." He said that the last year's working had been most satisfactory, after the outlay of £1100 incurred in repairing the faulty gasholders. At the meeting which took place this time last year, he told them that the average annual increase in the consumption of gas was 2½ million cubic feet, and that from all he could gather there was every reason to suppose that this increase would continue. He believed he also mentioned that he calculated the consumption for the coming year would perhaps be very much in excess of this quantity, and it had been considerably in excess, for the increase had, he believed, exceeded by 4 millions that of the preceding year. There was no doubt, too, about this, that the increase would go on in a greater ratio in the future than it had done in the past, because there was not only a larger number of persons, living within the same area, who consumed gas now who did not consume it before, but there was a gradual increase in the population; building was going forward, a greater number of persons were coming to reside in the town, large works and new public buildings were being erected, which all resulted in a larger consumption of gas. In addition to this, he did not hesitate to say the consumption would increase largely for cooking and heating purposes, and what would favour such consumption very greatly would be the fact that they were enabled to reduce the price of gas. This would render gas-cooking a matter of great economy, especially during the summer months, and for this purpose gas would be used to an extent of which they had at present but little idea. It was, therefore, a great satisfaction that the Directors were able, and, being able, were determined at once to reduce the price, and that they were also determined to reduce it to a uniform rate, so that the small consumers would benefit as well as others. It was to the small consumers that they must mainly look for the extension of which he had spoken, and which they were all anticipating. The Directors had reduced the charge for gas to 3s. per 1000 feet to all classes of consumers, and they had also reduced the annual charge for the public lamps to 60s. each. He hoped and trusted that this would be satisfactory to the Corporation. He thought the Directors had every reason to congratulate the public upon the fact that the Company had been enabled, at two or three of their last meetings, to reduce the price of gas, and altogether they had now reduced it to a very considerable extent indeed. He wished to observe, however, that the price was now so low that the Directors could not hold out any promise at all of a further immediate reduction; but in the future they might depend upon it that, if possible, it would be accomplished, as the works were so well laid out. In the midst of their congratulations, one thing had occurred upon which they could not congratulate themselves or the public. It was with great regret that the Directors heard that Mr. Darwin had received the offer of a situation which was so tempting to him that he could not do otherwise than give up the appointment which he held under them. Mr. Darwin's services had been so satisfactory, and he had been so useful to them in every respect, that it was with the deepest regret that they received the intimation from him that it was his wish to leave them. Not only had Mr. Darwin satisfied the Board, but he (the Chairman) believed he had satisfied all parties in the town who were interested in the supply of good and cheap gas. He had upon all occasions made himself agreeable to those with whom he had come in contact, and he (the Chairman) very much regretted, and he was sure the feeling was entertained by the rest of the Board and the public generally, that it was necessary to part with Mr. Darwin's services as Secretary and Manager. The Board immediately took steps for supplying the vacancy, and he assured them all that it was a matter of very great anxiety to the Board. They devoted themselves, at five or six meetings, to examining the testimonials of various applicants for the office. They had 40 applications, and he thought the Board had been very successful in the gentleman they had selected in Mr. Darwin's place.

The Rev. N. Cooper seconded the motion, and it was carried unanimously.

The Chairman proposed—"That a dividend, for the year ending June 30 last, be now declared at the rate of 7½ per cent. per annum upon the Company's stock (deducting the interim dividend of 3¾ per cent. paid in March last)."

Dr. Bentley seconded this proposal, and it was agreed to.

The retiring Directors and Auditor were re-elected, and a vote of thanks was passed to the Board for the care and attention they paid to the affairs of the Company.

The Chairman, on behalf of the Board, returned thanks, and said he assured them the Directors would at all times be ready to do everything they could, and to do it to the best of their ability, for the benefit of the Company. Of course, the success of the Company depended upon other management as well as upon that of the Directors. It was their duty to supervise, and he assured the Shareholders they would at all times do that to the best of their ability. Before he sat down he must tender the thanks of the Directors for the services rendered by the new Manager during the short time he had been with them. So far as he (the Chairman) had been able to judge, it fully justified the choice which the Directors had made. He should therefore propose that the thanks of the meeting be accorded to Mr. Belton, their present Secretary and Manager.

Dr. Calvert seconded this motion, and it was carried with applause.

The Chairman said so impressed were the Board of Directors with the services rendered by Mr. Darwin, the late Manager of the Company, that it was considered whether they ought not to take some steps to show their estimation of those services, and they determined to present him with what was then upon the table. He would call upon Dr. Calvert to make the presentation on behalf of the Company.

Dr. Calvert said he did not think a pleasanter task could have fallen to his lot than this. He had been deputed by the Directors, some three or four meetings ago, to take steps for providing the *matériel* for a testimonial to present to Mr. Darwin; but in Mr. Darwin's presence he felt that he could not do more than say he fully endorsed every word that the Chairman had said. The result of the steps he had taken, and of a consultation with Mr. Darwin, had been the purchase of the silver service that was then before them. He must ask the Shareholders to endorse what he had done with regard to this business, and to assume the responsibility of it to a certain extent. He was sure that he and all of them wished Mr. Darwin every prosperity in his new sphere; and concluded by presenting the plate, expressing the sincere hope that Mr. Darwin's future career might be a success.

[The service was of solid silver, and comprised a tea and coffee pot, basin and tongs, and cream ewer. They were all massive and of elegant design. The tongs were pierced, and the rest of the articles plated internally with gold. The coffee-pot, upon one side, bears the following inscription:—"Presented by the Shareholders to S. B. Darwin, Esq., Secretary and Manager for thirteen years of the Shrewsbury Gaslight Company, Sept. 25th, 1879." On the reverse were engraved Mr. Darwin's initials, and also upon the other articles.]

Mr. S. B. Darwin said he could hardly find words to thank them sufficiently for the kind feelings which had animated them in presenting this testimonial. For thirteen years he had been associated with the Company, and he had always done what he considered the best to promote its welfare. When the offer to go to Portsmouth was made to him, he was some time before he could accept it; for, having had charge of the Shrewsbury works so long, and having done all he could to make them successful, he felt that he was giving up the results of the labours of the past thirteen years—the best part of his life. The accounts presented to the meeting were for the year to June last, and to that time he was responsible to the Company. He thought that the works were now placed in the position that nothing would require to be done except outside work, consisting of new mains, and a new gasholder on the land recently acquired. To the present works nothing would be required to be done for some time, and, therefore, what the Directors would have to do would be to work the concern, and carry out the principles which had been already laid down. He believed that the Company would, for many years to come, hold its own against any electric light or any other light that might be brought forward, both for cheapness and general usefulness. As to the testimonial which they had presented to him, it was evidence of the kindness which he had always received at the hands of the Board, and he believed he could say that during the whole time he had been connected with the Company he had never had one unpleasant word, and never had fault been found with what he had done. It was very satisfactory and pleasing to him to find that his services had been so well appreciated.

Mr. W. Belton expressed his thanks for the kind manner in which his name had been mentioned, especially as he had been connected with the Company but a very short time, and they had scarcely had time to become acquainted. With the past working, of course, he had nothing to do, for, as Mr. Darwin said, it belonged to him, and he (Mr. Belton) could only say that in the future he would devote his best endeavours to give satisfaction to the public as well as to the Company, and he trusted that he should succeed.

The proceedings then ended.

Rio de Janeiro Gas Company, Limited.—The Directors of this Company have decided to pay, on and after the 11th prox., an interim dividend (balance of) at the rate of 10 per cent. per annum, free of income-tax, for the half year ended on the 30th of June last.

EXAMINATIONS IN "GAS MANUFACTURE."

The City and Guilds of London Institute for the Advancement of Technical Education have just issued their programme of technological examinations for 1880, which will be held on an evening in May to be afterwards announced. The examinations are conducted in much the same way as those of the Science and Art Department in subjects of pure science. The examinations are in three grades:—I. Honours; II. Advanced; III. Elementary. Grade I. is intended principally for foremen, overlookers, &c.; Grade II. for journeymen; Grade III. for apprentices; but candidates may enter themselves for any grade they choose. Certificates (first and second class) are awarded in each grade, and candidates who have taken a certificate may be again examined for one of a higher grade or class in another year.

The following prizes will be given in each subject:—

Honours . . .	1st prize, £5 and a silver medal. 2nd prize, £5 and a bronze medal. 3rd prize, a bronze medal.
Advanced . . .	1st prize, £3 and a silver medal. 2nd prize, £3 and a bronze medal. 3rd prize, a bronze medal.
Elementary . .	1st prize, £2 and a silver medal. 2nd prize, £2 and a bronze medal. 3rd prize, a bronze medal.

No first prize will be awarded to any candidate obtaining less than 85 per cent. of the full marks, and no prize to any candidate who does not take a first-class certificate.

Any person desiring to be examined may present himself, but before he can take a certificate in technology he will be required to have passed the Science and Art Department examination in certain specified science subjects. The object of this is to ensure that holders of the technological certificate shall have, at all events, a rudimentary knowledge of the scientific principles underlying his craft.

There is no limit as to age.

In the examination in "Gas Manufacture," Mr. A. Angus Croll is the Examiner; and the programme states that the examination will include questions founded on such subjects as the following, but will not necessarily be confined to these subjects:—

1. The characteristic properties of the various kinds of coal; their capabilities of producing gas having a high illuminating power; the relative value of the residual products.
2. The construction of a retort or oven best adapted for the destructive distillation of coal.
3. The setting and construction of retorts, made of iron or clay, set separately or in combination, and the advantages and disadvantages of the various systems employed, having regard to the fuel consumed, and the wear and tear of the apparatus.
4. The effects of temperature in modifying the quantity and quality of the gas produced.
5. The description of apparatus best adapted for condensing and cooling the gas, so as to get it into the most suitable condition for general purification.
6. The composition and special properties of the various agents employed for the purification of gas.
7. The best construction of gas-meters, having regard to continued correct registration.
8. The principles adopted in the construction, laying, and size of the mains employed for the distribution of gas, having regard to the distance of the source of supply, the various altitudes of the districts to be supplied, the quantity at present required, and the probable future requirements.
9. The pressure to be employed at the works to secure an adequate pressure at the points of consumption, having regard to the interests of both producer and consumer.
10. The simplest method of ascertaining the purity and illuminating power of gas.
11. The various kinds of machinery which may be used in gas-making in lieu of manual labour.

For full technological certificate, the candidate will be required to have passed, at least in the elementary stage of one of the following subjects:—Machine construction and drawing; Building construction; Acoustics, light, and heat; Magnetism and electricity; Inorganic chemistry; Geology.

In order to give an idea of the kind of questions to be answered, we reproduce the paper set for candidates at the examination in May this year:—

Honours.

1. In estimating the value of coals for gas manufacture, ought that value to be expressed in its power to produce so many cubic feet per ton, or ought it to be expressed in the quantity of light per ton, being equal to the production of light of so many units of the standard candle, or so many units of light of any other standard, and its cost per unit as manufactured into the gasholder?
2. In estimating the value of coal, ought the penetrating power to be taken as one element? That is, supposing that the light as shown by the photometer, at a distance of 100 and 150 inches, gives certain results to be compared with the like photometrical experiment with other coal.
3. Is it desirable to open and draw the retorts, before the whole of the illuminating gases are expelled by regulating the heats, or arranging the charges by the time the regular hour of charging comes round, and why?
4. Do the impure gases which are generated, if the distillation is carried on too far, dilute and injuriously affect the higher illuminating gases to a greater extent than the bulk of those impure gases?
5. What are these gases?
6. State the evil effect arising from the presence of ammonia in the injury to gas-fittings and to meters?
7. Ought exhausters to be applied, and in what way is security to be obtained to prevent atmospheric air being drawn in?
8. What treatment ought the gas to undergo in condensing and washing? And ought the whole of the ammonia to be arrested before the gas is brought in contact with the purifiers for removing sulphuretted hydrogen and other impure gases?
9. Can machinery be brought in with advantage to aid manual labour?
10. Having regard to safety and convenience, where several million feet of gas are required, what is the most desirable size and construction of gasholder to be adopted?
11. What are the relative advantages, in arranging gas-mains in busy thoroughfares, with large feeding-mains in the centre of the streets, and small ones on each side of the footways, not exceeding 3 or 4 inches in diameter, to which services are to be connected, upon the same principle as those used by the Great Central Company, and the ordinary plan in general use?
12. Can salts or acids be employed in freeing gas from ammonia, especially metallic salts, such as the residuum of certain chemical manufactories, and what are they?
13. Can the loss of gas which arises from the diffusion of gases be modified; and do you know of any facts to show that these forces are modified when the gas is supplying, or in motion, compared with when it is at rest?
14. Can you give any facts where the most extensive leakage, caused by the most defective pipes and mains, will account for a percentage of leakage nearly approaching what is generally attributed?

Advanced Grade.

1. The object of the manufacture of gas being to supply pure and cheap light, coals ought to be selected which shall afford light of the purest and highest illuminating power, equal to the light obtained from, say, some other well-known and standard light. Give a calculation illustrative of this proposition?
2. What is the best and cheapest description of a setting of retorts?
3. What quantity of gas ought a retort of a given size to produce during its lifetime?
4. At what price per 1000 feet of gas made can such approved setting produce gas, so far as fuel, labour, and wear and tear are concerned?
5. Can iron and clay retorts be made in combination with advantage, placing the iron in one separate arch and the clay retorts in another, upon the plan used by the Great Central Company, or any other plan, and what are the advantages?
6. What are the advantages of using red-hot fuel, and clinkering the bars from below instead of from the furnace-doors, as carried out by the Great Central Company?
7. Is it necessary or desirable to employ high chimneys, or to adopt any means of having a larger draught upon the escape-flue of a retort furnace than what can be obtained from the ordinary ascending flue of such furnace—say not more than 10 feet in height, such as those first introduced by the Great Central Company?
8. Ought exhausters to be applied, and in what way is security to be obtained to prevent atmospheric air being drawn in?
9. Ought a test-flame to be kept constantly burning, and placed in a position where the observation of the foreman may notice any change in the illuminating power of the gas being manufactured?
10. What are the causes of the incrustation of carbon inside retorts, and how can it be best and most safely removed?
11. State the relative advantages of turned and bored pipes compared with spigot and faucet?
12. Can you give any facts where the most extensive leakage, caused by the most defective pipes and mains, will account for a percentage of leakage nearly approaching what is generally attributed?
13. May the largest percentage be appropriated to waste of public light, inaccurate registration of meters, and careless inspection? Give an illustration.
14. Would it be an advantage to have a monthly inspection and that each inspector should, once every quarter, take a five minutes observation of the consumption indicated by the small horizontal drum at the top of the index of the meter, and thus ascertain if the gas measuring is consistent with the number of burners then burning?

Elementary Grade.

1. What are the most important considerations to be kept in view for selecting a site for the manufacture of gas?
2. May the gasholder with advantage be erected near or at the centre of consumption, where the gas is mostly required?
3. The object of the manufacture of gas being to supply pure and cheap light, coals ought to be selected which shall afford light of the purest and highest illuminating power, equal to the light obtained from, say, some other well-known and standard light. Give a calculation in illustration of this proposition.
4. What is the best and cheapest description of a setting of retorts?
5. What quantity of gas ought a retort of a given size to produce during its lifetime?
6. At what price can such selected setting of retorts be erected in your locality?
7. At what price per 1000 feet of gas made can such approved setting produce gas, so far as fuel, labour, and wear and tear are concerned?
8. Can iron and clay retorts with advantage be set in combination, placing the iron in one separate arch, and the clay retorts in another, upon the plan used by the Great Central Company, or any other plan, and what are the advantages?
9. What are the advantages in large works of the "through and through" retorts, as first introduced by the Great Central Company?
10. What are the advantages of using red hot fuel, and clinkering the bars from below instead of from the furnace doors, as carried out by the Great Central Company?
11. Name the causes of stopped pipes, also the remedy.

HAMMOND'S PROCESS FOR THE PURIFICATION OF GAS.

We have been asked by several subscribers to give an account of the process patented by Mr. J. Hammond, of the Lewes Gas-Works, for the purification of gas by concentrated liquid ammonia; and, having had the drawings, which accompany the specification of his patent, reproduced, we now publish them, together with the inventor's own description.

The patent is dated June 14, 1878 (No. 2376), and is for "An Improved Method of, and Apparatus for the Complete Purification of Coal Gas by Concentrated Liquid Ammonia, and the Recovery of Sulphur and Ammonia for the Manufacture of Sulphuric Acid and Sulphate of Ammonia."

The object of the invention is to complete the purification of coal gas by means of the strong liquid ammonia (produced as described in the specification of a patent granted to Mr. Hammond, dated Oct. 15, 1877, No. 3817*), and to recover the sulphur and ammonia for the purpose of making sulphate of ammonia. The chief value of the invention consists in providing suitable apparatus whereby a constant stream of strong alkali ammonia is produced and distributed in such a manner that it is capable of dealing with all the ordinary impurities of coal gas as efficiently as the materials more generally used for purifying purposes. The expelled sulphuretted hydrogen is converted into sulphuric acid by a simple and direct method, and the surplus ammonia can be recovered at pleasure as sulphate of ammonia.

To carry out the invention, the strong liquid ammonia having become fully impregnated with impurities from the crude gas, the liquor is received in a large iron tank underground, and closely sealed to prevent loss of ammonia. The contents of this tank are kept in continuous circulation by means of pumps connected with large high closed tanks above ground. These tanks are so arranged that the liquor of the greatest specific gravity may be retained for the purpose of manufacturing sulphate of ammonia, or for concentrating and distillating strong liquid ammonia, as described in specification No. 3817, of 1877. The overflow liquor from the high tanks, after passing through a series of pipes surrounded by running cold water in a suitable apparatus to regulate its temperature, returns to pumping-tanks, and is then forced by means of pumps through a series of strong cast-iron towers or vessels, for the purpose of

* See JOURNAL, Vol. XXXIII., p. 22.

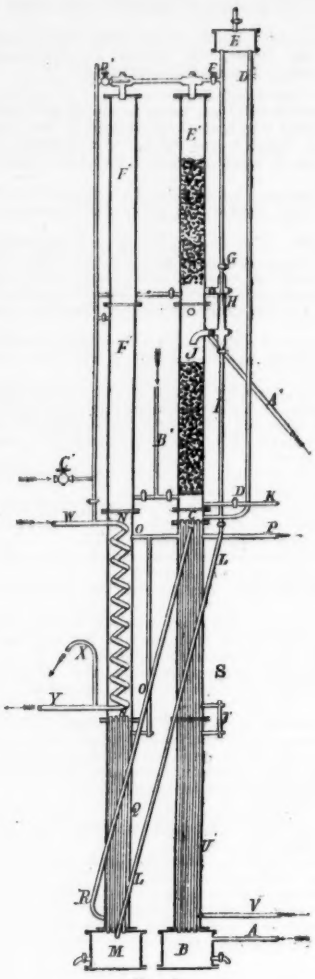


Fig. 1.

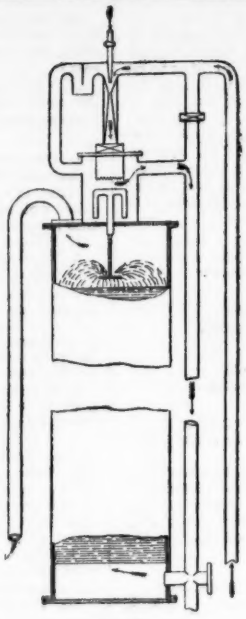


Fig. 2.

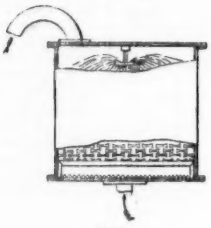


Fig. 3.

Fig. 4.

Fig. 5.

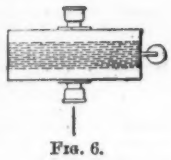


Fig. 6.

Fig. 7.

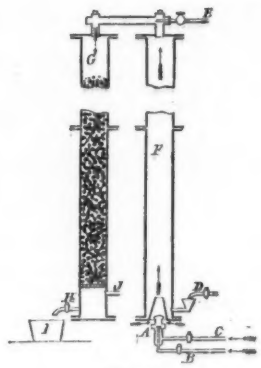


Fig. 8.

being continuously purified from carbonic acid and sulphuretted hydrogen, before being brought into close contact with the gas. These vessels are so constructed and arranged as to form distinct chambers for the cold liquor entering them, and for the purified liquor passing on to the purifying vessels, to be described further on. Distinct chambers are also provided in the towers for steam to heat to a suitable temperature the liquor passing through tubes in the chamber, and for the gases escaping from the heated liquor. A vacuum is also produced in the gas chamber by means of a water-jet arrangement, as shown in fig. 1. The gas chamber is also filled to a proper height with coke or other material, and the heated gas liquor is made to splash over it, and, in descending through it, is met by a small measured stream of coal gas, admitted to the lower part of the chamber for the purpose of assisting to remove the foul gases from the descending liquor. These gases are then drawn away and forced through suitable iron boilers or vessels containing milk of lime, and from thence they pass away to a suitable furnace, and assist in the direct formation of sulphuric acid.

The vessels containing the milk of lime can be changed as often as necessary, being provided in duplicate, and so arranged that heat can be applied and the contents distilled off, as described in the former specification before mentioned. A small quantity of the hot purified liquid ammonia from the towers is conducted to the extreme end of the hydraulic main, and, being met by a jet of steam, is forced through a suitable nozzle in the form of vapour of ammonia, and passing each dip-pipe from which the crude gas is escaping, it raises the temperature of the gas, and passing onward to the outlet of the hydraulic main, slowly condenses with the gas, and absorbs therefrom a portion of its impurity.

To prevent the escape of condensable vapours from the outlet of the condenser, a vessel is provided and fitted on the inside with a large number of pieces of thin hoop iron, so arranged as to break up the gases into the thinnest possible streams. The speed of the gas through this apparatus is regulated by the height of the water-line and overflow-pipe, the water also serving as a self-acting bye-pass in case of need.

The purified liquid ammonia, when made cold by passing through suitable cooling-pipes in the towers, is conducted direct to a series of vessels for purifying the coal gas from carbonic acid and sulphuretted hydrogen. These vessels may be constructed as described in the specification before mentioned, and termed the scrubber-washer, or in square-built iron towers, fitted on the inside with layers of thin plate or hoop iron, placed at a suitable distance to give the best effect to the passing gas. To recover the ammonia, clean water is used in ordinary coke scrubbers. Excess of watery vapour or moisture in the gas can be absorbed by passing the gas through a small amount of quicklime placed in the ordinary purifiers, or by other suitable means. After using the liquid ammonia to purify the gas as described, it can be returned to the circulating tank, and the process repeated. When the strong liquid ammonia becomes weak through using excess of water to recover the ammonia from the coal gas, the liquor can be re-distilled, as described in the specification of the 1877 patent. The residual water and carbonate of lime left in the boilers can be run off by suitable means.

The purifying towers for the liquid ammonia are strongly bolted together with elastic joints, rings of leaden pipe, with the air closely sealed in them, and the whole covered with the best red rubber. These are capable of resisting great pressure, and also allow for expansion and contraction of metal under uneven temperature.

A modification of the purifying towers will, the inventor states, be found very useful to prepare crude gas liquor for the ordinary scrubbers or washers in works where it is not desired to purify the gas entirely by concentrated liquid ammonia. Exhaust or live steam may be used to heat the gas liquor passing through the towers. The condensed hot water may be used as a hot feed for the steam-boiler.

For the purpose of examining the work of each purifying vessel, a small syphon well is provided, leaving a suitable outlet for the liquid from each scrubber or washer, and vent-pipes to the closed tanks. This well is fitted with a moveable glass cover, and sealed with a water-lute to prevent loss of ammonia. Suitable thermometers, hydrometers, and other necessary indicators are also fixed in connection with the liquor-purifying towers, to guide in their proper working.

In the drawings, fig. 1 is a sectional elevation of the cylindrical purifying towers for liquid ammonia. A is the inlet for the cold liquid ammonia, which enters the chamber B, and there deposits any sediment or tarry matter. The liquid flows up through the tubes in the chamber U and S to C, and flows out by the pipe D D to the top cistern E. It then passes down the pipe to the cocks F and G, but only a limited quantity is allowed to trickle through cock F. H is a water-jet arrangement to draw and drive the gases from chambers F^1 F^1 and E^1 to J, and out by the exit-pipe A^1 to the distilling boilers or the acid towers. The falling liquor may in part descend through the chamber J, and may be met by a measured stream of coal gas pumped through pipe B^1 to assist in carrying off the impurities from the liquor. The liquor passes on through the pipe L L to chambers M at the bottom of the second column, the pipe K being a clearing-pipe to the distilling boilers. The liquor then rises up through the tubes in chamber Q to chamber N, which is kept hot by means of the coil and the exhaust steam from the engine. The foul gases separate from the liquor in this chamber, and rise up and away through chambers F^1 F^1. The hot purified liquor now passes out at pipe O O, and flows into chamber Q, out at pipe R, and into chambers S and U, and comes out cold at V, and then away to the coal gas purifying vessels or scrubbers. P is the pipe to supply the hot purified liquor for the hydraulic main. X is the vent-pipe for exhaust steam, which enters the coil by the pipe W. Y is the hot feed-water pipe to steam-boiler. C^1 and D^1 are inlets for live steam to clear the chambers of deposits, and to mix with the gases rising in chamber F^1 F^1.

Fig. 2 shows a part-sectional elevation of the square-built iron scrubber fitted with a water-jet arrangement to bring the purified liquor into close contact with the coal gas, and at the same time to draw and drive the coal gas up through layers of thin sheet metal or hoop iron to meet the falling liquor a second time.

Fig. 3 is a part-sectional elevation of the scrubber-washer; and fig. 4 is a plan of rings of metal in the interior.

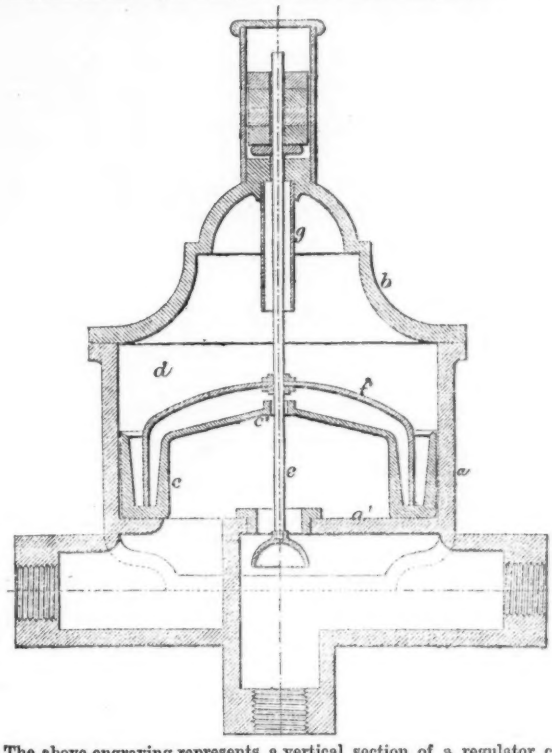
Fig. 5 is a plan of the bell or cap that covers the entrance-pipe, to make the coal gas pass through the liquid.

Figs. 6 and 7 show the plan and elevation of the apparatus for extracting tarry matter at the outlet of the ordinary gas-works condenser; it being very important to free the coal gas of these matters before bringing it into contact with the cold purifying liquid ammonia in the scrubbers and washers.

Fig. 8 is part-sectional elevation of iron towers or chambers lined with lead for the direct manufacture of sulphuric acid in connection with the foregoing apparatus. A is the arrangement for mixing and burning the gases from the liquor-purifying towers. B is the inlet for the sulphurous gases. C is the inlet for the coal gas. D supplies water for evaporation in towers F. E is the steam supply for mixing and driving gases to chambers G, where it condenses in the form of acid. The chamber may be filled with coke or other suitable material. J is the outlet for waste gases to the flue. H is the cock to draw off the acid to the lead tank I.

STOTT'S GAS-PRESSURE REGULATOR.

Among the things shown at the recent Gas Apparatus Exhibition at Greenock, described by our Correspondent in the JOURNAL of the 16th inst., was Stott's improved mercury-tight self-acting gas-valve or governor, which formed the subject of a patent dated Jan. 3rd last, No. 29.



The above engraving represents a vertical section of a regulator constructed according to this invention. In it, *a* is the shell or body of the regulator, which is ordinarily made of cast iron; *b* is the cover of the same; and *c* is an improved mercury trough, which rests upon the bottom, a^1 of the diaphragm chamber, *d*, and is so cemented or secured in position as that a gas-tight joint is formed between the inner wall of the chamber and the exterior wall of the trough. The valve spindle, *e*, which is connected with the diaphragm, *f*, passes through the central aperture in the conical shield, c^1. It will be seen that the gas-regulator, when charged with mercury, may be shaken to a great extent when in transit from one place to another, and may even be inverted and restored to its correct position, without the mercury finding its way into the lower gas passages. A tube, *g*, is attached to the crown of the cover, or a tubular projection is formed thereon, so as to prevent the outflow of mercury in case of the inversion of the regulator. The inventor states that he does not confine himself to the annular form of the trough, nor to the conical form of the shield, c^1, nor to the formation of the shield in one piece with the trough, as it may be separately formed, and afterwards fitted or secured to the trough in any suitable manner.

SOMETHING ABOUT EXHAUSTERS AND NAPHTHALINE.

By Mr. F. EGNER, Norfolk, Va., U.S.A.,

[From the *American Gaslight Journal*.]

The value of the exhauster as part of the plant of a well-furnished gas-works is unquestionable, and is generally thoroughly understood; yet there are works in this country, not to speak of other countries, in which the exhauster is not used; and it has happened to me several times that inquiries were made by parties intending to use an exhauster in the future, as to which would be the best and cheapest. This subject of exhausters ought to be an interesting one to all gas makers; therefore the following paper may not be unwelcome.

Exhausters may be divided into three classes—reciprocating, rotary, and steam-jet. Reciprocating exhausters are employed in many European gas-works, while the various forms of rotary exhausters are generally preferred in American works, because the action of this style of exhauster is more steady throughout than the reciprocating variety; although, were a vacuum chamber employed in the inlet as well as the outlet end of the reciprocating cylinders, that style of exhauster would thereby be greatly simplified and improved. It is surprising that this has never been done. It is my opinion that suitable "vacuum," or sometimes called "air chambers," if placed on the inlet and outlet of the rotary exhauster, would entirely do away with the pulsations of the gas in the hydraulic main, about which we hear so much at times. The reason for this ought to be plain enough to all who will take the trouble to inform themselves as to the action of the "vacuum" or "air chamber" in connection with improved pumping machinery; and the exhauster is, after all, only a pump. The steam-jet is the most simple of all exhausters, and so far as taking off the gas and relieving the retorts from pressure is concerned, works as well as any. There are several styles of even this simple apparatus in the market. The usual governors will regulate this exhauster perfectly, principally because with this exhauster we have no ridiculous fly-wheel on an engine, which counteracts the governor, and does the very thing which the gas-governor is intended to prevent. The steam-jet is manifestly the cheapest as to first cost and maintenance. We require no engine to drive it, and it needs no repairs, no oil, and no attendance; and, for small works, it would seem to be especially desirable, but for one very serious drawback, which, however, might perhaps be avoided. Now, why is this exhauster not more generally employed? This is a question which would be difficult for any one individual to answer.

The following experience may shed some light on the subject, as well as be of interest to those who have never used the steam-jet exhauster. We have one rotary and two steam-jet exhausters at the works here, but use the steam-jet only in case of a break-down in the rotary or its engine. The reason why we do not use the steam-jet constantly is this: Whenever we run the steam-jet for any length of time, we find all the pipes about the scrubber and condenser closing up with naphthaline. There is no doubt about it. The steam-jet seems to induce the rapid formation of naphthaline, and hence we are obliged to use the rotary. One exhauster is placed directly after the hydraulic main, before either the scrubber or condenser. That is the best place to put the exhauster, if it be a rotary, because the tar which the gas carries with it at that point will amply lubricate the exhauster, and save much oil and occasional annoyance. As the tar is carried with the gas in innumerable small globules, which in that condition are easily and thoroughly acted on by the steam of the jet, naphthaline is thus evolved in larger quantities than the gas can carry, and so when the gas reaches the condenser or scrubber the naphthaline is deposited.

My experience is that the illuminating power of the gas is slightly increased whenever the steam-jet is used. As we know that naphthaline is a rich hydrocarbon, and bearing in mind the action of steam on tar, the reason of this is self-evident. It is more than likely that, were our steam-jet exhauster situated so as to act on the gas after it had passed the scrubber, the deposit of naphthaline would be greatly diminished, and perhaps entirely stopped. It could not but be interesting if some of the gentlemen who have long used the steam-jet exhauster would be pleased to communicate their experience in the matter.

GAS LIGHTING AT MARSEILLES.

According to a report contained in a recent number of the *Journal de l'Eclairage au Gaz*, the consumption of gas at Marseilles continues steadily to increase, owing to the greater facilities now afforded for its more general employment. The Company who hold the concession for lighting the city have, by the extension of their mains and the laying on of branch-pipes and house-services, similar to those fixed by the Paris Gas Company, been the means of bringing about this satisfactory state of things. A table has been prepared by the Company, showing the progress in the consumption of gas since the year 1872, previous to which date no advancement whatever was made, and from this we learn that in the year alluded to something like 316 million feet of gas were sent out from the works for consumption, being nearly 35 millions more than in the preceding year. The consumption last year was close upon 370 million feet, and the annual increase during the past six years has been, on the average, at the rate of 2·82 per cent. The additional consumption in the year 1878 is attributable solely to an increase in the private rentals, the public lighting remaining almost stationary. The increase would most undoubtedly have been higher had not the general position of the commerce and industry of Marseilles been seriously affected by the war in the East, as well as by certain internal affairs; and the augmentation in consumption that has taken place has been produced by putting on additional burners in the private houses, the consumption per burner having actually diminished. It may therefore be hoped that an increase in consumption will continue to be experienced in the future, proportionate to that of the past few years, by the simple fact of a return to the average amount of gas burned at each jet. The extensions of the mains for the purpose of supplying gas for heating purposes, and for driving the various kinds of gas-engines, now so easy of practical application, will ensure large additional demands on the works and plant in the future. At the close of the year 1878 the Company had in the ground a total length of 120 miles of mains.

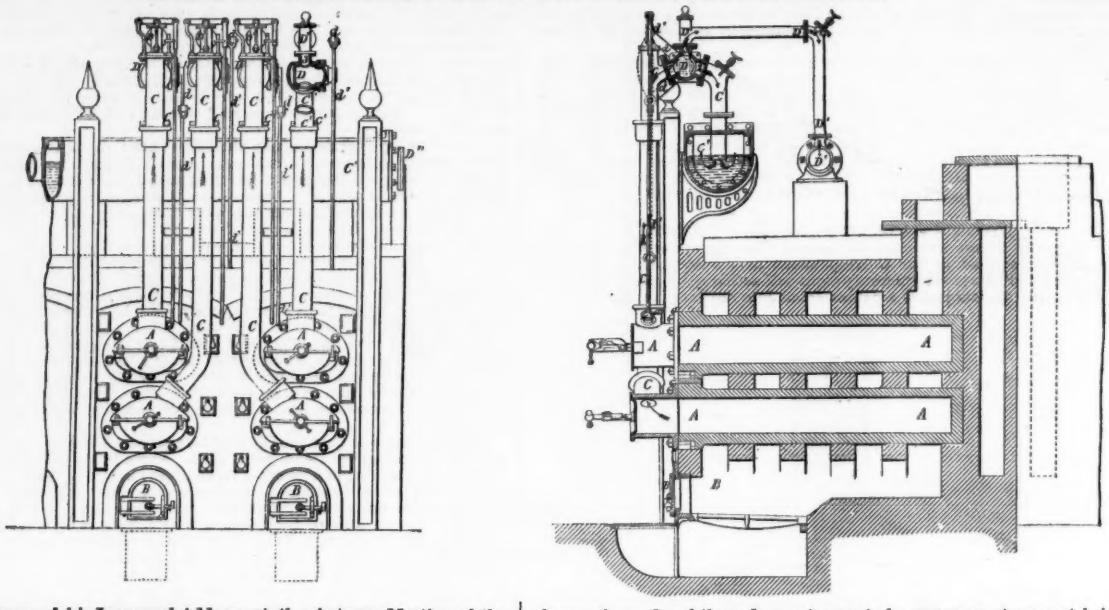
While engaged in developing the consumption of gas to the greatest possible extent, the Company were not unmindful of the fact that additional storeage room would soon be required commensurate with the heavier demands that would in the future be made upon them. They were therefore led to construct a large additional telescopic gasholder capable of containing 650,000 cubic feet of gas, which it is expected will suffice to meet all the necessities of the increased consumption to which they look forward.

The works have been supplied with coal brought principally from England. Owing to this the Company were able, in the course of the past year, to secure great advantages, consequent upon the very moderate prices then ruling in the market, and upon the exceptionally low rates of freight from Newcastle to Marseilles. The coals obtained from the Department of the Loire were likewise low in price, though, on the whole, somewhat dearer than the English gas-making coals. But while the Company have benefited by the low price of coal, they have, almost as a consequence, experienced considerable difficulty in disposing of their coke. Notwithstanding the very severe winter, and the persistent endeavours of the Directors to export their coke, they would have found themselves hampered with an inconveniently large stock of this residual, if they had not been able, owing to some change in the mode of working blast-furnaces, to employ it for the manufacture of cast iron in the works of St. Louis.

Like all other gas companies, that at Marseilles had for a very brief period been occupied with the question of the competition that was likely to take place with the electric light; but the Directors had come to the conclusion that the comparative trials of the light that have been made up to the present time show that all the advantages of economy and good lighting are secured by the employment of gas, and consequently there does not seem to be any ground for troubling themselves any further—at all events at present—about the competition of electric lighting.

STEALING WATER IN SOUTH STAFFORDSHIRE.—Last Wednesday, at the Guildhall, Walsall, five persons were fined 5s. each and costs, or ten days imprisonment in default, for having stolen water, the property of the South Staffordshire Water-Works Company. Mr. Glover, who appeared in support of the charges, said that in the mayoralty of Mr. Checkley that gentleman announced that the Authorities would compel property owners to lay on a supply of the Company's water, and since then the Company had proceeded against very few persons. They were constrained, however, to begin to prosecute again, the stealing of water having become very general; and as they could not get at the landlords, who in many cases were in fault, they were obliged to proceed against those actually taking the water, and these often were children who had been sent by their parents.

MILLER'S IMPROVEMENTS IN THE MANUFACTURE OF ILLUMINATING GAS.



In the course of his Inaugural Address at the Autumn Meeting of the West of Scotland Association of Gas Managers, as reported in last week's JOURNAL, the President (Mr. R. Mitchell, of Coatbridge) made reference to an invention of "Improvements in the Manufacture of Illuminating Gas, and in the Utilization of the Impure Products resulting therefrom," patented by Messrs. Archibald Miller, sen. and jun., of Glasgow. The patent is dated Nov. 19, 1878 (No. 4700), and the specification states that the invention has for its object the production of illuminating gas from ordinary coal dross, "tripping," or small coal.

The accompanying engravings show a front elevation and sectional elevation respectively, the latter taken through the retort and heating furnace of a bench of four retorts, A, and their two heating furnaces, B, below, all much of the ordinary construction used for making illuminating gas from the usual gas coal, but here shown as arranged and fitted with one arrangement of the connections or appliances and fittings necessary for carrying out the invention.

The improvements consist in fitting a three-way cock, D, in the bend of the usual uptake or syphon drawing-off pipe, C C^{1}, leading the gas from each retort direct from the cock, D, to the hydraulic main, C^{11}, to be conducted as usual to the ordinary arrangement of gasholder and intermediate purifiers when desired, and all as indicated by the arrows. The internal key of each of the cocks, D, is fitted with a lever or handle, d d^{1}, so as to be able to turn it with facility from the front of the retorts in one direction to conduct the gases from the retort straight through the key and cock, D, by the two opposite branches, 1, 2, direct into the hydraulic main, at the same time shutting the communication through the third or upper branch, 3, which is fitted with a branch conducting-pipe, D^{1}, from each cock to a large or main pipe, D^{11}, common to the whole set of retorts. This is for conducting the impure gases either to a gasholder for subsequent use for heating purposes, or by other pipes to the furnaces for heating the bench of retorts. When the key of the cock, D, is turned in the opposite direction by the lever and handle, d d^{1}, it opens the cock, D, so as to conduct the impure gases from the retort through it by the upper branch, 3, and pipe, D^{1}, to the new main drawing-off pipe, D^{11}, at the same time shutting the communication to the hydraulic main, C^{11}.

In carrying out the invention, each retort is charged with common coal dross, "tripping," or small coal; and when the retort has been raised to the necessary heat, the light hydrocarbon gases evolved during the first 10 to 20 minutes, according to the quality of the dross or "tripping" used, are led off through the cock, D, and branch-pipe, D^{1}, from the ordinary ascension drawing-off pipe, C (leading to and before it passes through the hydraulic main), into a separate main gas-pipe, D^{11}, leading to a gasholder of an ordinary construction, where this impure gas is stored for use, or sale for heating purposes in the furnaces of marine boilers, steam cars, land engines, or other furnaces, and for other heating purposes. Or, instead of leading the impure gas into a special holder from the pipes, C^{1} and C^{11}, it may be conducted by special pipes down into the furnace, B, where it is burned by combining with the air for heating the retorts.

After this impure gas has been allowed to escape into the special holder for collecting it, or into the fire-grates, the escape through the pipe 3, D^{1}, is shut off by the three-way cock, D, and, at the same time, allows the purer gas, then being evolved, to flow in the usual direction into and through the hydraulic main, C^{11}, for the space of about 1½ to 2 hours, when it is again shut off by reversing the cock, D, fitted between the ascension and dip syphon-pipe, CC^{1}, at the same time opening the communication from the retort through the cock, D, and branch-pipe 3, D^{1}, for the residuary impure gases afterwards evolved to be led into the separate holder for storeage and use, or down into the furnace, B, as before; the heating of the retort being then continued for the space of about 30 to 45 minutes. By this method of stopping the flow of the gas from any retorts before the distillation reaches the sedimentary stage, a thoroughly pure gas is said by the inventors to be obtained, altogether free from any bisulphide of carbon. It is stated that a ton of common coal dross yields about 10,000 cubic feet of gas of an average illuminating power of 20 candles, and by this method of taking off the gas from the retorts about 1000 feet at the first stage of the distilling process, and leaving about 1000 feet to be taken off at the last stage of the process, about 8000 feet of very pure gas are obtained, of an illuminating power equal to about 28 candles.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade generally throughout this district continues very dull, and it cannot be said that there is any material improvement to notice since last week. The only description of fuel which is meeting with any increased demand is the better class of round coal for house-fire purposes, for which naturally more inquiry is expected as the winter season approaches. Gas coal collieries continue pretty busy making deliveries on account of contracts, but new orders are not being received. Of the common classes of round coal there does not seem to be any more at present being taken by works, and burgy and slack still only meet with a very slow sale. Some advance is being made in the Manchester district in the delivery rates for house coal, but prices generally are without alteration. At the pit mouth, quotations range about as under:—Best Lancashire round coal, such as Arley mine, for house-fire purposes, 8s. to 8s. 6d. per ton; inferior qualities of Arley, for gas-making and house purposes, 6s. to 7s.; Pemberton four-feet, 5s. 9d. to 6s. 6d.; common round coal, 4s. 6d. to 5s. 3d.; burgy, 3s. 9d. to 4s. 3d.; and slack, 2s. to 3s. per ton, according to quality.

Some of the house-coal collieries are working rather more time, but generally the pits are still only very poorly employed.

A fair business has been doing for shipment, but orders have to be taken at very low figures.

The coke trade is without material change, the demand not being sufficient to keep more than half the ovens burning, and prices range from 10s. to 14s. per ton, according to quality.

The iron market here has been in rather an excited state during the past week, owing to the rapid upward movement which has taken place in other districts, and amongst dealers and speculators there has been a good deal of anxiety to buy for forward delivery, whilst some fair sales for shipment have been made during the week at full prices. The amount of iron going into actual consumption locally is still only small, and consumers, as a rule, seem now rather disposed to hold back than purchase largely at the prices at present being asked. For Lancashire pig iron delivered into the Manchester district the quoted prices are 47s. for No. 3 foundry, and 46s. 6d. for No. 4 forge, less 2½ per cent. discount; and for Lancashire bars, £5 10s. to £5 15s. per ton.

Many of the forges are now tolerably well supplied with orders, and amongst founders and engineers there appears to be rather more doing, but in the position of machinists there is no material improvement.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There were again rather short shipments of gas coals last week from the Durham colliery districts, through a limited arrival of tonnage. Handy steamers have been very much in request for coasting purposes. They have been bad to procure, the most of them are in the Baltic, bringing away the autumn cargoes. Four shillings is the rate paid at Newcastle for steamers to load coals. The business done for sailing vessels to discharge gas coals at the wharves in the Thames is 4s. 10½d. and 5s. per ton. Several small sailing vessels were chartered last week to load gas coals for Ireland. There has been a slight advance upon late quotations. The gas business to the east coast and British Channel has increased. Shipments of gas coals to the North of France have improved, as they always do at this season. Next month the larger gas companies will begin to further increase their consumption, and more steam tonnage will have to be engaged. From the circumstance here alluded to—a scarcity of steam tonnage—the larger collieries working best gas coals have experienced a difficulty in clearing their output, and they have had to make a slight pause in their operations one day or so, to prevent an accumulation of coals in the waggons. The general condition of the gas collieries is healthy and good; they are likely to work uniform full time over the winter. In a short time the supply of steamers will be abundant, the present hindrance being very temporary, for in less than a month boats will be coming out of the Baltic, and will have to be put into coasting. It is quite as likely as not that the then supply of tonnage will be in excess of the requirements of trade. There is a drawback which is affecting the shipments of gas coals at present. The harvest in the South of England has been from a month to six weeks behind the usual of average seasons. Corn cargoes have thus not been ready for shipment to the North of England, and we have not had the supply of sailing tonnage at command as usual to take away coals from here. The second-class collieries in the trade begin to improve their output; with the drawback mentioned, they are working very well. Trade begins to fall off at the steam collieries; but they are doing fairly well for the time of year. The demand for manufacturing coals has improved over the fortnight. The coke trade, however, is rather dull.

A considerable upward reaction took place in the Cleveland iron trade last week. Whether it is likely to be permanent may be questioned. There is a good demand from America. Lead fell 2s. 6d. to 5s. a ton last week. Lead pipes may be quoted at from £15 to £16 a ton. The chemical market is pretty steady. Ash and soda crystals have improved about 2 per cent. in price. Other articles are stationary. The shipments of fire-bricks and fire-clay goods to the Continent are considerable. Cement and other goods of that description are in moderate demand. The timber trade seems to have wrought its way to a better position, by merchants

keeping their stocks down; but an advance in prices has not been arrived at.

In the labour district of the North of England the tendency is undoubtedly to lower wages. Men are resisting a decision of Mr. David Dale, the Arbitrator in the iron trade, but the pressure of poverty is too great to keep back the inevitable. The prospects of large bodies of working men out of employment in the winter are anything but satisfactory. There is no probability of any change in the wages of coal miners, however, either one way or the other; they are likely to remain as they are.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On the evening of Friday week an agreeable termination was given to the Exhibition of Gas Apparatus recently held at Greenock. The Committee of the Exhibition and other gentlemen connected with the Watt Institution, in which it was held, entertained the exhibitors to supper in the White Hart Hotel. Bailie Brynmer occupied the chair, and Dr. Marshall discharged the duties of the vice-chair. A number of toasts suitable to the occasion were proposed and responded to. In proposing the toast of "The Exhibitors," the Chairman claimed that the exhibition of apparatus for utilizing gas in cooking and heating operations, and in lighting—the first of its kind in Scotland—had been a great success. The toast was replied to by Mr. Smith, of Messrs. Billing and Co., London, who, on behalf of the exhibitors, heartily thanked the Committee for the kindness and courtesy which they had received in Greenock. An able and very suggestive speech was made by Mr. Thomas Ogilvie, F.C.S., in proposing the toast of "The Profession of Gas Managers," to which Mr. Samuel Stewart, Manager of the Greenock Corporation Gas-Works, replied in suitable terms. On the closing day of the exhibition there were no fewer than 1800 visitors, and during the whole of the ten days that it was open about 11,000 persons visited it. In so far as it brought the advantages of the more general use of gas before a large number of the public, the exhibition was certainly a great success.

An agitation has already commenced with the view of having a gas apparatus exhibition held in Glasgow, and it is expected that in the course of a week or two it may assume some practical shape.

On Thursday last the half-yearly meeting of the Shareholders of the North British Railway Company was held, at the close of which a special meeting was held for the purpose of passing several resolutions, one of which was—"That an agreement between the Magistrates and Town Council of Burntisland and the North British Railway Company, dated the 25th and 30th days of July, 1879, providing for the sale by the Company to the Town Council of the gas-works at Burntisland, in pursuance of the Burghs Gas Supply (Scotland) Act, 1876, as now submitted to the meeting, be, and the same is hereby approved of."

At the usual monthly meeting of the Montrose Police Commissioners, held last Monday, a letter was submitted from the Secretary of the Gas Company, offering to supply gas to the public lamps for the ensuing year at the rate of 4s. 8d. per 1000 cubic feet for one-hole jets with 4-inch flame, and 11s. 2d. each for flat-flames, being 5d. for the former and 1s. for the latter under last year's charges. The letter led to some discussion, in the course of which the Chairman remarked that the reductions in price should have been just double what were mentioned. Mr. Ford said he observed that the Company stipulated that, if the burners were found to be of larger size than those mentioned in the offer, they should be paid for the difference; but he thought there should be a stipulation that, if the gas supplied was less than what was bargained for, the Board should get a deduction. Mr. Mitchell thought it a marvellous thing that gas should be dearer in Montrose than in Brechin. Mr. Gouk said that it was dearer in Montrose than in any town of the same size in Scotland. In the course of some further talk, it was suggested that the subject should be remitted to the Lighting Committee. It was ultimately, however, agreed to accept the Company's offer for another year.

The balance-sheet of the Hamilton Corporation Gas-Works for the year ending March 14, 1879, has just been published. Under the head of property and assets it includes a sum of £25,463 12s. 8d. The works account shows a total of £12,233 12s. 8½d., considerably more than one-half of which is for extension of works during the year, and the item for coal is fully £2000. The sum collected during the past year for gas and meter hire was £4445 6s. 11d. For new mains and service-pipes there was paid £527 10s. 8d., and for new meters the sum of £205 12s. 5d.

The question of lighting the district of Longside, one of the southern suburbs of Glasgow, engaged the attention of a meeting of ratepayers on Monday, the 22nd inst. It was stated that 100 lamps were required, and 30 were already erected. It was resolved to erect the other 70.

Markinch, one of the most important manufacturing villages in Fifeshire, is now earning an unenviable degree of notoriety in showing a disposition to remain in a benighted state during the winter months, the ratepayers having declined to pay the necessary expenses for lighting the street-lamps. At the last meeting of the Gas Company it was unanimously resolved to give a supply of gas for the street-lamps without charge, but on condition that the lighting was properly looked after. Finding that the ratepayers are unwilling to assess themselves for the street lighting, and that the Lighting Committee have in consequence ceased to act, it is not unlikely that a movement will soon be started to have the village brought under the advantages of the Scotch Police Act.

The Loch Ashie water scheme, which was only completed within the last two or three years for the town of Inverness, is already showing itself to be unequal to the wants of the burgh, inasmuch as the present consumption of water is considerably above the quantity conveyed by the pipe from Loch Ashie to the reservoir. Nothing has yet been done towards remedying the matter. It is considered that a double pipe will be required, the cost of which is put down at £2000. At a meeting of Police Commissioners, held last Friday, the assessments were agreed to—1s. in the pound on houses, 6d. on shops, and 1d. on the heritors—the same as last year.

The Edinburgh and District Water Trust met on Wednesday last, when it was reported that, in view of the proposed application to Parliament for additional borrowing powers, a remit had been made to Messrs. Leslie and Cameron to prepare a report showing the amount required to complete the works and construct the Rosebery reservoir; as also to state why provision was not made in previous Acts of Parliament for sufficient borrowing powers for those purposes. The assessments for the year were imposed, the domestic rate being 7½d., or 1d. in the pound more than last year. There was submitted a statement prepared by Mr. Cameron, in compliance with instructions, showing the estimated cost and the actual cost to August 30th of the Moorfoot works; as also the expenditure in obtaining Acts of Parliament and other charges connected with the scheme. A leading member of the Trust (Bailie Colston), when speaking on the question of the proposed additional borrowing powers, said that the Moorfoot scheme would yet require £200,000 to finish it.

Much excitement has been shown in the Glasgow pig iron market during the past week, and prices have gone up in leaps and bounds, as high as 56s. 9d. cash having been paid on Friday forenoon.

There is an improvement in the coal trade, both in respect of the home demand and for shipment.

THE PUBLIC LIGHTING OF SPENNYMOOR.—At the meeting of the Spennymoor Local Board last Wednesday, it was resolved, in consequence of the high price charged by the Gas Company for the supply of gas to the street-lamps, that in future the streets be lighted with oil.

SALE OF GAS SHARES AT DOVER.—Last Thursday, 230 new shares in the Dover Gaslight Company were sold by auction, the prices realized averaging from £14 10s. to £15 2s. 6d. per £10 share. At the previous sale of shares of this Company, on the 3rd of July last, 200 shares were sold at an average price of £14 14s. per share.

DEATH OF MR. T. C. IRISH.—The following announcement appeared among the "Deaths" in *The Times* last Thursday:—On the 23rd inst., in the 61st year of his age, Thomas Cowling Irish, Chemist and Druggist, 36 years a resident of Southgate, N., Organizer of the Colney Hatch Gas Company, and for 19 years Secretary, Inspector, and Collector to the same.

SUFFOCATION BY GAS AT HALIFAX.—An old pensioner named Jeremiah Sullivan, and Theresa, his wife, were found dead in bed at Halifax last Saturday, having been suffocated by an escape of gas on the premises of the Junior Liberal and Exchange Club, where they lived, and of which they were in charge.

SHEPPY GAS COMPANY.—The Directors of this Company, as authorized by the Company's Act of Parliament, have declared interim dividends for the first half of this year at the maximum rates of 4 per cent. per annum on the A shares, and 10 per cent. per annum on the B and B* shares, the balance of profits of £143 (equal to ¾ per cent.) being carried to the reserve-fund. The Company, on the 1st of July, reduced the price of gas to ordinary consumers, to 4s. per 1000 feet, for prompt payment. The public lamps of the Sheerness district, which are supplied on the average meter system, are charged at the same rate.

ARTESIAN WELL-BORING IN SAN FRANCISCO.—San Francisco is largely supplied with water by artesian wells, of which, it is said, there are not less than 200 in the city. While in London and elsewhere it has been noticed that the supply of each well decreases in proportion to the increase in the number of wells, such an effect has not been observed in San Francisco. In some of the San Franciscan artesian wells the water is reached at a very small depth. One of the hotels is supplied by a well 38 feet deep. Another has a well 60 feet deep, furnishing 6000 gallons of water per day. A candle factory has a well 168 feet deep, which gives a supply of 10,000 gallons per day. A local newspaper has been putting up a building, for which a new well is being bored, which is expected to supply 8000 gallons per day. One reason for the large number of artesian wells in the city has been the severe rates charged for water by the Corporations through which the city has received its supply.—*Engineering.*

LEEDS CORPORATION WATER SUPPLY.—Last Saturday's *Leeds Mercury* stated that, at the request of the Water-Works Committee, of which he is Chairman, Alderman Croft would yesterday turn the first sod of the new reservoir at Eccup. The new reservoir—which will form an important extension of the Leeds water-works system, will be constructed to hold 1400 million gallons of water. This represents a storeage equivalent to about 200 days supply, or certainly for more than six months, the present daily consumption of water in Leeds being about 7 million gallons. One great advantage anticipated from the new reservoir is that it will afford this ample reserve comparatively free from the risk of floods or accidents of any kind in the valley of the Washburn, or on the line of pipes between Washburn and Eccup. As the reservoir will receive no flood waters, its contents will travel with a very slow motion from one end to the other, remaining long enough to be completely filtered and purified before passing into the service-pipes. It is therefore expected that the water supply—which, although good and wholesome, is now somewhat peaty in colour—will improve in purity and clearness.

INCE WATER-WORKS.—The water supply for the township of Ince is obtained, says the *Wigan Observer*, from deep wells sunk in the red sandstone rock at Golborne, and the water is forced by pumping-engines from the water-works into the district of Ince, which lies at a higher elevation than Golborne. Up to about a month ago the water was delivered into a small tank at the top of Belle Green Lane, and this necessitated the working of the pumping-engines almost constantly, in order to maintain the pressure. A considerable quantity of water is used in the district for trade purposes, and this water is drawn to a great extent in the night time. In order to keep up a constant supply, and to be in a position to enable the engines to stand for several days together, the Local Board decided to construct a reservoir or large tank at the highest part of the district, and, after some consideration, it was agreed to take advantage of the present low prices and construct the tank of iron. The tank rests on a concrete foundation raised about 9 feet above the level of the natural ground. It is 100 feet in diameter, 15 feet deep, and holds 700,000 gallons. The total weight of iron (including the columns which carry the roof) is 293 tons. The weight of the plates is 249 tons. The five wrought-iron bands or straps round the side plates weigh 15 tons, bolts and nuts 6 tons, and the weight of caulking material is 15 tons. There are 559 cast-iron plates in the tank, and 10,400 bolts. The tank is covered in by means of planking fastened on pitch-pine beams, and supported by cast-iron columns. The weight of the water when the tank is full is 3125 tons, and up to the present time no flaw has been perceived, and the joints remain water-tight.

EDINBURGH AND DISTRICT WATER SUPPLY.—At the meeting of the Edinburgh and District Water Trust last Tuesday, the Clerk read the estimates of the income and expenditure for the current year, which were agreed to. The income was estimated as follows:—Meter supply, £8300; shipping, £550; lime, £1200; special and miscellaneous, £7600; arrears of water-rate, £325; rents in town and country, £178 12s. 8d.; pipe joinings and miscellaneous receipts, £270—giving a total of £18,098 12s. 8d. The following was the estimated expenditure:—Salaries, £2378 15s.; wages, £2760 15s.; repairs, £2844 4s. 7d.; feu duties, £442 19s. 4d.; rents, £211 14s. 5d.; taxes, £4617 13s. 1d.; printing, £116 19s. 6d.; stationery, £70; advertising, £75; interest, £5037 15s. 3d.; annual surface damage, £13 6s.; annuities, £24,323; expenses, £1044 14s. 5d.; law expenses, £150; sinking-fund, £870; expense of transference of loans, £213 16s. 8d.—making a total of £65,175 13s. 3d.; and leaving to be raised from the rates a sum of £47,074 0s. 7d. The assessments the Finance Committee recommended were as follows:—Upon houses of £6 rent and under, 4s.; on houses above £6, and not exceeding £10, 7½d. per pound, payable by proprietors; on houses exceeding £10, 7½d. per pound, payable by occupants; on shops, 2d. per pound; and on lands and heritages, a public rate of 1d. per pound. This would give a total of £45,801 18s. 1d., which, with certain additions in the way of collection of arrears, &c., brought up the total estimated income to £46,684. In accordance with a resolution adopted at the previous meeting of the Trust, the Treasurer submitted the following details as to the cost of the Moorfoot scheme:—"The Parliamentary estimate of 1873–74, up to the municipal boundary, which did not include filters or town pipes, was £325,000. Add works not included in above, Rosebery reservoir, landowners pipe, Musselburgh pipe, town pipe, and Alnwick Hill filters and tank, £91,330—making a total estimate of £416,330. The actual cost up to Aug. 30, 1879, is £321,073 4s. 10d.; add for

land and surface damages, £65,980 1s. 1d., which makes the actual cost at the above date £387,053 5s. 11d. The sum estimated to complete the works, not including anything for extension of town pipes, is £93,000. There has been expended also the following sums:—For Acts of Parliament, £26,485 14s. 4d.; land and surface damages, £65,980 1s. 1d.; general charges, Engineers fees, and legal expenses, £13,208 15s. 8d.; extension of town pipes in new streets, £51,451 12s. 2d.; Edinburgh Water Company, £22,889 9s. 5d.; stamp, &c., for transfer of property to the Trust, £1274 12s. 5d.; expenses on loans and mortgage, £3368 15s. 2d.; St. Mary's Loch Bill, £21,353 9s. 3d.; and Midlothian Water Company, £10,000."

RAILWAY RATES FOR COAL.—Owing to the depressed state of the coal trade, the low price at which coal has to be sold, and the reduction of miners wages in all parts of the country, attention has been directed to the charges made by railway companies for the conveyance of minerals, with a view to a revision of the rates, and the executive of the South Yorkshire Miners Association are preparing a petition for presentation to the House of Commons during the next session of Parliament, praying for a Royal Commission to inquire into the subject. It is asserted that owing to the rate charged by the Great Northern Railway, the quantity of coal taken by it to London, more especially from South Yorkshire, has fallen off, while that sent over the Midland and North-Western lines has increased in a marked degree, as is shown by the following statement of the tonnage of coal carried to London by the three Companies named, from 1852 to 1878 inclusive:—

	Great Northern.	London and North-Western.	Midland.
1852	195,862	137,975	—
1853	358,775	173,346	—
1854	398,561	271,010	—
1855	547,602	339,656	—
1856	591,434	443,672	—
1857	531,819	476,496	—
1858	524,711	481,499	—
1859	431,500	533,730	39,570
1860	502,813	693,418	58,490
1861	537,225	743,542	69,329
1862	415,812	666,131	156,362
1863	550,908	759,763	165,984
1864	803,169	961,697	137,340
1865	975,509	1,093,725	152,737
1866	1,006,277	1,188,999	156,645
1867	1,044,125	1,243,390	157,246
1868	938,405	1,059,177	183,701
1869	911,839	753,517	760,082
1870	978,049	835,281	923,660
1871	1,096,551	833,758	1,394,505
1872	1,030,224	1,034,814	1,615,399
1873	1,037,286	1,046,920	1,655,962
1874	872,646	962,533	1,587,301
1875	1,003,539	1,084,495	1,666,333
1876	889,302	1,242,169	1,553,474
1877	905,297	1,310,126	1,613,014
1878	926,082	1,269,740	1,734,039

The marked increase in the Midland from 1869 was the result of the opening of the Company's direct line to St. Pancras. It is noticeable that in those years in which the Great Northern conveyed the largest tonnage of coal to London, the rates on that line were at their lowest.—*Sheffield Telegraph.*

Register of Patents.

780.—AHRBECKER, H. C., Stamford Street, London, "*Improvements in meters or apparatus for measuring or ascertaining the flow of fluids, which improvements are also applicable to obtaining motive power.*" Patent dated Feb. 25, 1878.

This invention relates to that description of fluid-meter wherein the fluid is caused to pass, through oblique passages in a fixed plate or diaphragm, into helical or oblique passages formed in a rotary body carried by a central spindle, so that the fluid is impinged obliquely against the surfaces of the passages, and then, flowing through them, imparts rotary motion to the body, and, through its spindle, to the counter. An apparatus so constructed formed in part the subject matter of a former patent, No. 3914, dated the 10th of October, 1876.

According to the former invention, the helical or oblique passages with which the rotary body—the "screw"—is provided were formed in the longitudinal direction of the screw, which was open for an approximately equal area at both ends. One part of the present invention consists in either entirely closing the outer end of the screw, and making the outlets of the helical or oblique passage in the side of the screw; in partially closing this outer end, leaving the outlets of the passages therein, but of a restricted area; or in the employment of two series of outlets, one series in the side of the screw, and the other series in its outer end, the screw at this end being in the latter case made preferably in the form of a frustum of a cone, with its smaller end outwards.

804.—BROWN, P. S., Carrickfergus, Ireland, "*Improvements in the obtainment of sulphate of ammonia from ammoniacal liquors, and in the apparatus employed therefor, the said improvements being also applicable for the obtainment of cyanide and sulpho-cyanide of ammonium.*" Patent dated Feb. 27, 1878.

According to this invention, the ammoniacal liquor is mixed with sulphuric acid, in quantity, however, insufficient to render it acid; that is to say, the acid may be sufficient to neutralize the alkali of the liquor, or less than sufficient, in which case the liquor is slightly alkaline.

The liquor, after the sulphuric acid is thus added to it, is placed in a vessel, which may be of iron or other suitable material, and to this vessel heat is applied, which drives off the water as steam, and when concentrated far enough allows the ammonia to crystallize out. During the time of evaporation the tendency of the concentrating liquor is to become acid, and this tendency is counteracted by adding alkali thereto from time to time.

An arrangement of apparatus found well suited for the purpose of practically working the invention consists of a vessel in which the acid is added to the ammoniacal liquor. From this vessel the liquor is discharged into a boiler or other like vessel, wherein it is partly concentrated, and from this it is led successively through a series of concentrating vessels, by which it is gradually increased in density.

In the last vessel of the series the crystals of sulphate of ammonia are thrown down in the boiling liquor, and are obtained by being dipped out therefrom and placed on a drainer in the ordinary manner. In arranging the vessels for operating the process, the more intense heat of the fires is caused to act upon the upper parts of the vessels, and the less intense heat to act upon their bottoms.

The cyanides and sulpho-cyanides of ammonium may also be obtained from ammoniacal liquors when treated in the manner described; that is to say, the cyanides or sulpho-cyanides, being highly soluble, will collect in the last vessel of the series up to a considerable proportion before being precipitated. So soon as they begin to precipitate with the sulphate of ammonia, that vessel is disconnected from the series, in which case the preceding vessel becomes the last of the series, thus preventing the discharge into the disconnected vessel of more concentrated liquor. The liquor in this vessel is then evaporated, the cyanides and sulpho-cyanides crystallizing out.

865.—MILLAR, R., Kilmarnock, N.B., "*A new or improved meter, applicable for measuring water or other liquids, part or parts thereof being applicable to piston meters generally.*" Patent dated March 4, 1878.

The meter constructed according to this invention consists of a box or chamber preferably formed of two hollow hemispheres across the centre of which is fixed, by a liquid-tight joint, a hemisphere of india-rubber, leather, or other flexible material. To the centre of this diaphragm a rod is attached, carrying at its outer end a toothed rack which gears with a spur wheel on a shaft, to which a driver is fixed. The driver, as the shaft is rotated, carries a weighted tumbling lever round with it, until the lever is driven into a position slightly beyond the vertical, so that it can fall over either in a right or left hand direction; that is to say, corresponding to the direction in which the driver has moved it.

Upon the horizontal shaft, or on a stud co-axial therewith, there is carried loosely a triple-armed lever, one arm of which is connected by a rod to a lever carried on the plug of a four-way cock or its equivalent. The ways of the cock alternately communicate with inlet ports or passages, one leading into each half of the spherical box or vessel, and therefore on opposite sides of the diaphragm. They also communicate alternately with the discharge orifice of the apparatus.

The effect of admitting water or other fluid to the inlet side of the four-way cock is, that passing on through one of the admission ports or passages at one side of the spherical vessel, it forces the flexible diaphragm to the opposite side of the vessel, and therefore moves the toothed rack through the same distance. On arriving at the end of its path in one direction the toothed rack has operated the driver, so that it has brought the weighted tumbling lever just into the position to fall over, the act of doing which reverses the four-way cock and therefore causes the water to be admitted to the opposite side of the spherical vessel, and that admitted to the previous stroke to be expelled through the discharge orifice, the entire apparatus during this second stroke acting in a reverse direction. At each alternate stroke of the apparatus motion is communicated to a dial, which, by indicating the number of times the chambers have been filled and emptied, will enable the amount of liquid which has passed through the meter to be readily ascertained.

870.—WORRALL, R. J., Tue Brook, Lancs, "*Improvements in street-lamps and other like structures, and in the mode of securing the glass in the same, which latter part of the invention is applicable also to securing glass in other structures.*" Patent dated March 4, 1878.

In carrying out this invention, a trough-shaped piece of stiff metal is secured at each of the angles of the lamp, and the length of the pane is extended. In the groove is placed sheet rubber, entirely lining the groove, and on inserting the pane of glass in the two opposite rubber-lined grooves, it is securely held.

891.—BARROW, J., Clayton, near Manchester, "*Improvements in manufacturing ammoniacal salts, and utilizing certain waste products.*" Patent dated March 5, 1878.

According to this invention, earthy basic substances in combination with sulphur, as sulphides or sulphydrates, as hereinafter described, are used for liberating ammonia from its acid and haloid compounds (to obtain ammoniacal salts), recovering sulphur, and producing earthy carbonates. The combinations of these earthy basic substances with sulphur exist in waste gas lime from gas purifiers, either wet or dry, also in the vat waste of alkali works, or may be obtained by heating a mixture of spent oxide of iron and milk of lime. Hence the invention utilizes waste or spent lime from gas purifiers, waste or spent oxide of iron from gas purifiers, and vat waste from alkali works, in the manufacture or production of ammoniacal salts, sulphur, and earthy carbonates, and the lime and the oxide of iron are revivified.

In carrying out the invention, crude ammonia water is mixed with either spent gas lime or vat waste, or with sulphide or sulphydrate of calcium. The relative proportions of the ammonia water and spent gas lime or vat waste, or sulphide or sulphydrate of calcium, will, of course, depend upon the percentage of acid and haloid bodies in the ammonia water, and the percentage of sulphur in the spent gas lime, vat waste, or sulphide or sulphydrate of calcium (as the case may be), which will vary in different cases, and should be ascertained by the usual tests. The proportions employed should be such as to effect decomposition as completely as possible. By double decomposition, and subsequent distillation with fire or steam in any suitable apparatus, there are liberated and separated the volatile compounds of ammonia and sulphur from the non-volatile acid or haloid compounds of the earthy basic bodies employed.

The volatile compounds are caused to pass into combining vessels containing sulphuric or hydrochloric acid, in order to form ammoniacal salts, and the sulphuretted hydrogen gas given off is converted, by burning or heating in contact with atmospheric air or oxygen, into sulphurous acid, which may be utilized in the sulphuric acid chamber or for other purposes, or the sulphuretted hydrogen gas may be converted into free sulphur.

The non-volatile bodies consist in large proportion of carbonates. The insoluble carbonate of lime and waste liquor from the distilling apparatus are run off and allowed to settle in suitable tanks, then drained, dried, and afterwards calcined to restore the carbonate of lime to the condition of quick lime for re-use in gas purification, or the carbonate of lime may be again used in the ordinary process of manufacturing carbonates of soda or potash.

When using sulphide or sulphydrate of calcium, obtained by heating together milk of lime and spent oxide of iron from gas purifiers, the sulphide is washed from the insoluble oxide, and this liquor is employed in suitable proportion with ammonia water in the same way as the spent lime is used, distilling off the ammonium sulphide, and calcining the residual lime carbonate.

The insoluble oxide of iron is drained and partially dried, and is then fit for re-use in gas purification. The mixing of the bodies may be effected in the distillatory apparatus, or they may be decomposed in separate vessels, and only the soluble sulphide of ammonium, along with the soluble compounds of the earthy bodies, passed through or into the distillatory apparatus. Then may be dissolved out from the mass of waste earthy sulphides those sulphides which are soluble, and the resulting solution employed for decomposing ammonia compounds contained in ammonia water, treating the mixture as before described.

Instead of mixing together ammonia water and earthy sulphides, the process may be modified by submitting the ammonia water to distillation alone until all the carbonate of ammonia and sulphide of ammonium it contains has been driven off, and then adding to the residue in the distillatory apparatus (which contains acid and haloid compounds of ammonia) the requisite proportion of earthy sulphides to liberate the remaining portion of ammonia as ammonium sulphide.

The carbonate of ammonia and sulphide of ammonium are caused to pass into the combining vessels containing sulphuric or hydrochloric acid

to form salts of ammonia, and the carbonic acid and sulphuretted hydrogen gases liberated in the combining vessels are passed through layers of spent lime or vat waste, or other combination of earthy sulphides, in any suitable apparatus (as, for instance, a gas purifier, disconnected from the set, and containing foul or spent lime), the effect being the union of the carbonic acid with the lime and displacement of sulphuretted hydrogen, which is then carried forward along with the sulphuretted hydrogen originally contained in the ammonia water for conversion into sulphurous acid, sulphuric acid, or sulphur.

In all the processes described after the ammonia has been driven off and the carbonates obtained by subsidence, the mother or waste liquors contain other bodies which may be employed for the preparation of any of the alkaline, earthy, or metallic cyanides or sulpho-cyanides.

It is important to prevent as far as possible access of air or oxygen in any form, or sulphurous acid, which, by acting upon the earthy basic compounds with sulphur, would speedily change the composition of these bodies, and so interfere with the process.

For calcining the earthy carbonates obtained, close air-tight retorts, heated in the usual manner externally, are employed, as, for instance, the usual gas-retorts, and the carbonic acid liberated by heat is driven out from the carbonate of lime by jets of steam, suitable inlet and outlet pipes being used for the steam and gas, and it is either absorbed by means of ammonia water for use in the decomposition of earthy sulphides, or passed through the disengaged purifiers containing foul or spent gas lime, or similar apparatus containing vat waste, for the purpose of liberating sulphuretted hydrogen from these compounds. This action, when necessary, is assisted, by heating by steam or otherwise, the vessels containing the sulphur compounds to be operated upon, and, where necessary, the flow of these gases is regulated by mechanical means.

Where the plant is suitable, it is preferred to mix the waste or spent gas lime and ammonia water in the gas purifiers themselves, as soon as they are sufficiently foul and require changing.

942.—Linford, C., Leicester, "*Improvements in gas-engines.*" Patent dated March 8, 1878.

This invention consists in admitting a charge of combustible gas into the cylinders of gas-engines during the exhaust or return stroke of the working pistons, and also by the same stroke to compress the charge admitted, and on completion of the stroke to ignite the charge thus admitted and compressed. There is thus given an impulse to the working pistons on every outstroke of the same, giving to single-acting engines an impulse to each complete revolution of the crank, and in double-acting (complete) engines, two impulses to one revolution of the crank or cranks, thereby making a diagram in all respects the same as in steam-engines. The amount of compression in these engines does not exceed 15 lbs. per square inch (or one atmosphere), and as this pressure is not obtained until the piston is near the end of its stroke, the line of compression is shown in a diagram like the diagram of a steam-engine with the requisite amount of "steam lead." The charge being fired, as before stated, on the completion of the stroke the pressure rises until it reaches from 5 to 7 atmospheres, and gradually falls as the piston makes its outward stroke.

949.—Henderson, G., and M'Neil, D., Blackfriars Road, London, "*Improvements in valve-cocks or taps.*" Provisional protection only obtained. Dated March 8, 1878.

In carrying out this invention, the following arrangements mainly are adopted (taking as an example stop, bib, or ball valves or cocks):—The external shape is of any approved form, the opening for the spindle being at the side. The valve rests on its seat, and is covered by a screw cap or other covering, with a washer between to keep the parts tight. Through the opening in the side a spindle is inserted, which may either be made to screw in or be ground in. This spindle when in position comes internally under the valve, and the other end is formed or cast with a lever, handle, or other means for opening and closing the valve. The end of the spindle (internally) is formed of a cam shape or conical, or a portion of the spindle may be cut away for the purpose of opening and closing the valve, and when the valve is self-closing a spring is used, which bears against the upper part of the valve and the under part of the cap.

The action is as follows:—By turning the handle of the spindle the cam or eccentric acts upon the under side of the valve, raising it, and allowing the fluid to pass out through the nozzle or orifice. On releasing the handle it flies back by means of the spring, and the valve closes on to its seat, and is then held by the spring and the pressure of the fluid. When the valve or cock is not required to self-close, the spring is not used, and in this case the handle or spindle is thrown back in the ordinary way, the fluid pressing against the valve, retaining it on its seat when closed, though a spring may be used for low pressure if required.

1000.—Garrood, G. W., Twickenham, Middlesex, "*Improvements in cocks, taps, and valves for water and other fluids.*" Patent dated March 18, 1878.

According to these improvements, the main passage of the cock, tap, or valve is formed with one or more holes or openings forming outlet passages, which, when open, allow the water or other liquid to flow from the supply into an annular or other suitable chamber formed around or connected with the main-pipe, and from thence to an outlet passage or discharge-pipe. The collar or cap forming the annular chamber and discharge nozzle can be readily detached, by unscrewing, for cleansing or other purposes, when required; this arrangement also affording great facility for perforating or forming the outlet holes, openings, or ports in the tap or valve. The outlet or series of outlet holes or openings are closed and opened by means of a sliding plug, the inner end of which carries a cup leather, or a short length of india-rubber tube, or other suitable material, which covers and closes the outlet holes or openings when the cock or valve is closed, the pressure of the water or other liquid acting on the inner surface of the cup leather or tube to press it firmly to the sides of the pipe beyond, over, or upon the outlet passage or passages to cut off the discharge of the liquid.

1032.—Webster, G. E., Nottingham, "*Improvements in gas-burners and their accessories.*" Patent dated March 15, 1878.

This invention relates to gas-burners having several inclined jets so arranged that they, by their combination, cause an artificial draught for the air through the flame itself. The size of the holes through which the gas issues is made smaller than is the usual practice for fishtail burners.

In the first variety of burners, two rat-tail flames are used; that is, flames issuing from circular holes. These are placed close together, and either parallel or at a slight angle, so that in burning they join together by their own attraction; and in thus coming together they cause a current of air to ascend with them and between them.

In the second variety, a burner with four holes is used, each pair of holes being placed at an angle of about 32°, so as to form one sheet of flame similar to the ordinary fishtail burner. The axes, however, of the conical or parallel holes are in the same plane, and lines drawn down from the point of intersection of the two pairs of holes, and bisecting the base of each triangle so formed, are parallel.

The other varieties of burners are all based upon the principle of forming between the flames a flue or draught for the air, and thus producing an Argand burner without a glass chimney.

1033.—Lake, W. R., Southampton Buildings, London, "*Improvements in furnaces applicable for heating steam-boilers and gas-retorts, and for other like purposes.*" A communication. Patent dated March 15, 1878.

This invention relates to furnaces especially constructed for the production of carbonic oxide, and the mixing of the same with air heated by the waste heat from the furnace.

1077.—Waller, G., and Colyer, F., Holland Street, Southwark, "*Improvements in apparatus used in the manufacture of gas.*" Pated dated March 15, 1878.

This invention has for its object the construction of apparatus or governors worked by a vacuum or the pressure of gas, and arranged so as to act on the throttle-valve of the steam-engine, and so regulate its speed as to maintain a steady gauge. The apparatus consists of a cast-iron tank or cylinder capable of containing water, and from the centre of the bottom of which rises an inlet-pipe, fitted with a cap having a small hole or holes for the introduction of gas. Over the inlet-pipe, and within the tank, is a sheet-iron bell or gasholder, which rises or falls in proportion to the vacuum or pressure of gas within it. In order to give the bell the requisite buoyancy, it is provided with an annular float, which, though made separate from the bell, is capable of being attached to or detached from it whenever occasion may require the repair or renewal of the bell. Above the float and within the bell there is a deep annular space, to which water is admitted. On the outside of the bell, and just above the bottom of this annular space, there is an opening fitted with a slide-valve, the rod of which extends to the top of the bell, so that the attendant may by a handle open or close, or partially open or close the valve, and thus regulate the size of the orifice, and consequently the rate of speed with which water may be admitted to, or withdrawn from the annular space. On each side of the tank is fixed a standard or pillar, which supports a slotted cross-head. Fixed to the top of the bell is a rod or bar with a number of teeth in it, so as to form a rack, which rises and falls within the slot in the cross-head. Within this slot is also pivoted a quadrant, having on its periphery teeth that gear into the rack before mentioned. The spindle or shaft of the quadrant projects sufficiently on one side of the cross-head to admit of a slotted lever being fixed to it, the lever being so constructed as to allow of its attachment and subsequent alteration to any angle that may be desired. To the slotted lever is attached a rod which communicates with the throttle-valve of the engine.

APPLICATIONS FOR LETTERS PATENT.

3719.—Müller, H. L., Birmingham, "Improvements in illumination, and in apparatus employed for that purpose." Partly a communication. Sept. 16, 1879.

3724.—Rickman, J. P., St. Bride's Street, and Thompson, J. B., New Cross, London, "Improvements in the manufacture of ammonia and its compounds." Sept. 17, 1879.

3732.—Glaser, F. C., Berlin, "Improvements in gas and petroleum engines." A communication. Sept. 17, 1879.

3745.—Kitt, B., Bristol, "Improvements in public and private lighting." Sept. 18, 1879.

3747.—Cox, J. B., Torquay, Devon, "Improvements in gas regulators or governors for regulating the supply and pressure of gas." Sept. 18, 1879.

3749.—Hartley, J., Crank, Lancs., "Improvements in pipes and in pipe connections." (Complete specification.) Sept. 18, 1879.

3750.—Haddan, H. J., Westminster, "Improvements in electric lamps and mechanism for electric lighting." A communication. Sept. 18, 1879.

3771.—Brockie, J., Brixton, London, "Improvements in electric lamps." Sept. 19, 1879.

3793.—Harrop, J., Sheffield, "Improvements in apparatus and application thereof for producing and subdividing the electric light." Sept. 20, 1879.

3826.—Sugg, W. T., Westminster, "An improved coupling for gas, air, or water pipes." Sept. 23, 1879.

3827.—Reeves, H., Camberwell Road, London, "Improvements in the manufacture of gas, and in apparatus therefor." Sept. 23, 1879.

3848.—Grice, W., Birmingham, "Improvements in retorts used in the manufacture of coal gas." Sept. 24, 1879.

3851.—Redfern, G. F., Finsbury, London, "An improved meter or apparatus for measuring water and other liquids." A communication. Sept. 24, 1879.

3875.—Harrison, C. W., Southampton Buildings, London, "Improvements in electric lighting, and in the means or apparatus employed therein." Sept. 25, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1049.—Wilson, J. G., Manchester, "A new or improved water-meter." A communication. March 17, 1879.

1207.—Dillon, T. A., Dublin, "An improved method of and apparatus for producing electric lights, whereby such light can be more conveniently distributed, and economically maintained, in public places and private houses." March 26, 1879.

1270.—Turner, F. W., St. Albans, Hertford, "Improvements in and relating to gas motor engines." March 29, 1879.

1635.—M'Kenzie, J., Regent's Park, London, "Improvements in electric light apparatus." April 25, 1879.

2318.—Wild, R., Rochdale, Lancs, "Improvements in the manufacture of gas for illuminating and heating purposes." June 11, 1879.

2386.—Hartmann, W. E. A., Swansea, Glamorgan, "Improvements in the manufacture or production of sulphuretted hydrogen gas." June 16, 1879.

2428.—Joslin, G., Colchester, Essex, "Improvements in apparatus for ascertaining the hourly rate of gas consumed by gas-burners." June 19, 1879.

2792.—Melling, T., Liverpool, "Improvements in and relating to pistons, piston valves, pump buckets, and the like, applicable for use in water-meters or other hydraulic apparatus." July 9, 1879.

2871.—Allen, S. B., Massachusetts, U.S.A., "Regulating the supply of steam to a steam-engine, when used in operating machinery for extracting inflammable gas from one or more retorts employed in the production thereof from bituminous coal or other such gas-yielding matter or matters." A communication. July 15, 1879.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

3528.—Robinson, C. S., "Improvements in burners for burning a mixture of gas and atmospheric air." Sept. 8, 1876.

3547.—Webber, C. E., "Improvements in the manufacture of and mode of utilizing gas for heating or other purposes, and in the apparatus or means employed therein." Sept. 9, 1876.

3551.—Johnson, J. H., "Improvements in the treatment of the iron residues obtained in the purification of coal gas, and in the obtaining of products therefrom." Sept. 9, 1876.

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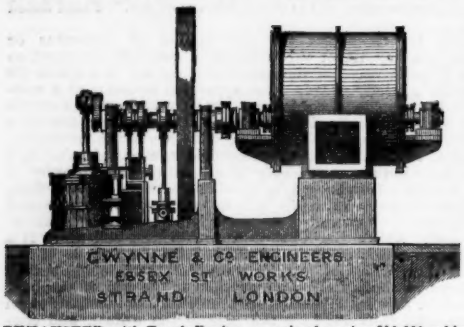

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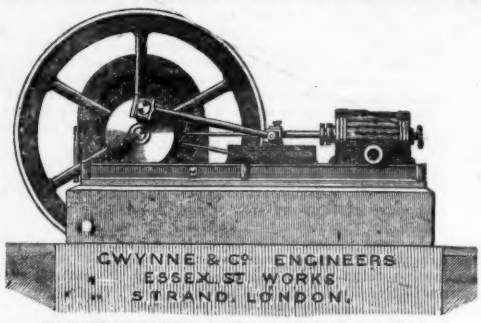

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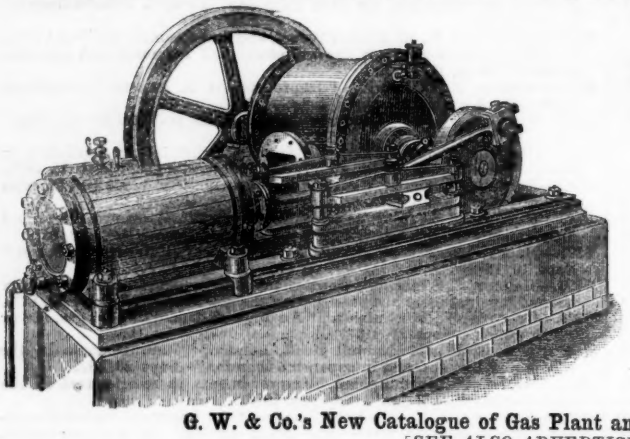

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WANTED, by the Advertiser, a Situation as MANAGER or ASSISTANT MANAGER of a large Works. Has had every experience in a Gas-Works. Satisfactory reasons for wishing to change. Good references and testimonials. Address No. 589, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

EAST RETFORD CORPORATION GAS UNDERTAKING.

WANTED, two thoroughly Steady and Reliable WORKING FOREMEN to take charge of the Gas-Works, and machinery connected therewith. Parties applying must be up in Carbonizing. References as to character and ability required. Particulars of duties may be obtained by applying as under.

FREDK. BAILEY, Manager.

FOR SALE—The complete Plant of a Gas-Works, with all Connections, in excellent condition, capable of making 10 millions. Will be sold together or separately. Apply at the Redcar Gas Company, Redcar, YORKSHIRE.

SLEAFORD GAS COMPANY, LIMITED.

FOR SALE.—Single Gasholder, 32 ft. by 14 ft., Counter-balanced, Connections and all complete, in good condition. Reason for removal, ground wanted. Particulars to be had of HARRY WIMHURST, Manager.

FOR SALE—Three Purifiers, 9 ft. by 6 ft. by 3 ft. deep, all complete, with grids and bearing bars for same. The above are for Sale in consequence of having been replaced by larger. No reasonable offer will be refused for the whole or for a portion. Apply to F. BOWER, Manager, North Bierley Gas-Works, Low Moor, near BRADFORD.

TO BE SOLD, Cheap, Three Telescopic GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield. For price, apply to THOMAS PIGGOTT AND Co., Spring Hill, BIRMINGHAM.

EXHAUSTER—Beale's 30,000 feet per hour; Makers, Burton and Waller; fit for immediate use—for sale cheap. For price and particulars apply to the MANAGER, Brentford Gas-Works, SOUTHALL.

GAS-WORKS TO LEASE.

MR. J. DOUGLAS, late Manager of the Portsea Island Gaslight Company, is prepared to Offer for the Lease of Gas-Works for periods of years. 1, Lombard Court, Gracechurch Street, LONDON.

PHŒNIX GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that the ADJOURNED HALF-YEARLY GENERAL MEETING of the PROPRIETORS holding, previous to the 30th of June last, £300 and upwards of paid-up capital in the said Company, will be held, pursuant to the Act of Incorporation, on WEDNESDAY, the 1st of October, at Two o'clock precisely, at the Bridge House Hotel, in the Borough of Southwark, for the purpose of declaring Dividends to the 30th of June last, and on other business.

The Transfer Books will be closed from the 10th of September until the 1st of October, both days inclusive.

By order,
T. A. CROOKENDEN, Secretary.

70, Bankside, London, S.E., Sept. 6, 1879.

RIO DE JANEIRO GAS COMPANY, LIMITED.

The SHAREHOLDERS are informed that the Transfer Books will be closed from the 25th inst. to the 2nd of October next, both days inclusive.

By order,
THOMAS DAWSON, Secretary.

No. 1, Gresham House, Old Broad Street,
London, E.C., Sept. 24, 1879.

GAS PLANT FOR SALE.

A 10-in. Vertical Pipe Condenser, having

20 Pipes, each 19 ft. high, on Cast-Iron Base Box.

A Scrubber, 16 ft. high 5½ ft. diameter, fitted with thin boards, Self-Acting Liquor Distributor, 10-in. inlet and outlet pipes.

Two Single-Flue Cornish Boilers (new in 1870), each 9½ ft. long, 3 ft. 9 in. diameter; Fire Tube of Low Moor Iron, complete with all Fittings.

All in good working order; removed to make room for larger plant.

For further particulars apply to THOS. TREWHITT, Gas-Works, WEST HARTLEPOOL.

May 8, 1879.

TO GAS ENGINEERS AND CONTRACTORS.

TENDERS and Particulars Wanted for

the Construction of small Gas-Works, capable of supplying gas for about 5000 lights.

Letters to be addressed "Gas-Works Tender," the MANAGER, Granville Hotel, ST. LAWRENCE-ON-SEA.

BETTWS-Y-COED GAS-WORKS.

THE Directors desire to dispose of the

Works, Plant, &c., of this undertaking, and invite TENDERS for the same, which are to be sent in not later than the 30th inst., addressed to the Directors, Bettws-y-Coed, near Llanrwst, Carnarvonshire.

Application to inspect the works and premises to be made to the man in charge.

TO GASHOLDER MAKERS.

THE Gas Committee of the Corporation

of Warrington are prepared to receive TENDERS from parties willing to contract for the Construction of a Telescopic GASHOLDER, 120 ft. in diameter and 23 ft. deep in each lift.

Plans and specifications may be seen on application to the undersigned, at whose Office sealed tenders, endorsed on the outside "Tender for Gasholder," will be received until Thursday, the 16th of October next.

The Committee do not bind themselves to accept the lowest or any tender.

JAMES PATERSON, Engineer.

Gas-Works, Warrington, Sept. 20, 1879.

FEATHERSTONE LOCAL BOARD.

THE following Tenders are wanted by

the above Board:—

No. 1. For 70 Cast-Iron LAMP-POSTS (six of which to have Boxes for Meters), 11 ft. 6 in. long, with Flange 20 in. in diameter to rest upon. Lamp-Irons to suit lamps. Carriage paid to Featherstone Station.

No. 2. For 70 Copper Lamps (7 oz. sheet) and glazed with 16 oz. glass, fitted complete.

No. 3. The Erection of 70 Lamps and Connecting with Main and final completion.

Tenders to be sent in to me, the undersigned, on or before Tuesday, the 7th of October next.

I. KABERRY, Solicitor, Clerk to the said Board.

Pontefract.

OLDBURY LOCAL BOARD GAS-WORKS.

THE Oldbury Local Board are prepared

to receive TENDERS for the Erection of a New GAS-WORKS, to supply their district with Gas.

The drawings and specification may be seen on application to the Engineer, Mr. A. Upward, 8, Queen Anne's Gate, Westminster, on and after Wednesday, Sept. 10, 1879, and sealed tenders are to be delivered to me, the undersigned, on or before Monday, Nov. 3, 1879, addressed to the Chairman and Members of the Oldbury Local Board.

Forms of tender may be obtained at the Office of the Engineer on payment of one guinea, which will be returned on the receipt of a *bonâ fide* tender on the form supplied.

The Board do not bind themselves to accept the lowest or any tender.

A. WRIGHT, Solicitor, Clerk to the Board.

Board Room, Oldbury, Sept. 23, 1879.

THE Directors of the Farnworth and

Kearsley Gas Company are prepared to receive TENDERS for the Surplus TAR produced at their Works for the Twelve months ending Oct. 31, 1880. The quantity estimated to be about 80,000 gallons. The Contractor must give security for the due fulfilment of the contract.

Tenders, sealed and endorsed "Tender for Tar," to be addressed to the Chairman, J. Warburton, Esq., and sent in on or before Wednesday, Oct. 15.

Any further information can be obtained from the Manager, T. L. SHEPPARD.

CORPORATION OF BIRMINGHAM—GAS DEPARTMENT.

THE Committee of the Gas Department

will shortly invite TENDERS for the TAR to be produced after the 1st of July next, at their Saltley, Windsor Street, and Adderley Street Works, in Birmingham, and their West Bromwich Works. The total quantity of Tar now made at these works is about 18,000 tons per annum.

The Committee are prepared to consider APPLICATIONS to LEASE a portion of the land belonging to the Gas Department at West Bromwich or Saltley, for the purpose of erecting works for dealing with the Tar produced at these stations.

The Committee will be glad to receive communications from persons who may wish to tender.

EDWIN SMITH, Secretary.

THE Directors of the Horsham Gas Com-

pany, Limited, invite TENDERS for their Surplus TAR and AMMONIACAL LIQUOR until Michaelmas, 1880.

The quantity for disposal is expected to be about 500 Barrels of Tar and 300 of Liquor.

No one Barrel to exceed 40 gallons.

The purchaser to provide barrels, when required, and to pay all railway charges.

The Company to pay all charges between their works and the Horsham Railway Station.

Tenders to state the price offered for Tar per barrel, and a scale of prices for liquor of 4, 5, and 6 degrees of Twaddel's Hydrometer.

Payments to be made quarterly.

Sealed tenders, endorsed "Tender," to be sent to the undersigned, on or before Saturday, Oct. 11.

ROBERT SHEPPARD, Secretary.

DONCASTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Borough of

Doncaster are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works from time to time during a period of One, Two, or Three years, from the 1st of October next. Coals carbonized, 6000 Tons per annum. The Tar will be delivered into barges in the River Don, alongside the Gas-Works, and in no other form.

Also for the Purchase of about 70 Tons of SPENT OXIDE. Original material, Irish bog ore.

Forms of tender and any other information may be obtained on application to Robt. Bridge, the Engineer.

Tenders, sealed and endorsed, to be sent in on or before Thursday, the 9th of October next, addressed to the Chairman.

The right to accept the highest or any tender is reserved.

By order of the Gas Committee,
Alderman W. C. CLARK, Chairman.

Gas-Works, Doncaster, Sept. 18, 1879.

THE Gloucester Gas Company, ceasing

to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

110 Mouthpieces, D-shape, 13 in. by 22 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. 28 Mouthpieces, D-shape, 16 in. by 20 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12 in. Slide-Valves and 12 in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12 in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair Mitre Wheels.

Set of four Purifiers, 12 ft. by 12 ft. by 4 ft., with 12-in. Centre-Valve (Cockeys), and Connections and Lift complete.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

Two 12-in. Governors, by Wright, London, with 12-in Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

WANTED, by Samuel Thompson & Co.,

Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT

KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

THE

IMPERIAL METER CO.,

LIMITED,

(Formerly Walter Ford, at Gray's Inn Road),

KING'S ROAD, ST. PANCRAS,

Manufacturers of THE IMPROVED DRY GAS-METER, THE PATENT WET GAS-METER, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

Now ready, price 6d. and 1s.

THE

SOFTENING AND PURIFICATION OF WATER

ON AN IMPROVED SYSTEM.

PART I. explains the application of the system to large or small supplies for Private Mansions, Schools, Colleges, Asylums, Hospitals, Public Institutions, &c. Price 6d.

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F. H. ATKINS & CO., ENGINEERS,
62, FLEET STREET, LONDON, E.C.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

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effecting a great saving of time, labour, and expense.

For particulars, price &c., apply to Mr. E. PRICE, Inventor and Patentee Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf Bankside, Southwark.

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These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

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All other Colours made to order.

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A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

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Established 1840.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

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FIRE CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
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FIRE-BRICK AND TILE MERCHANTS,
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DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
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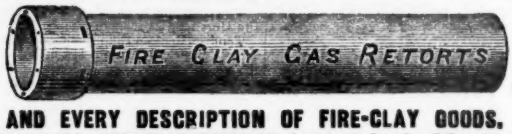

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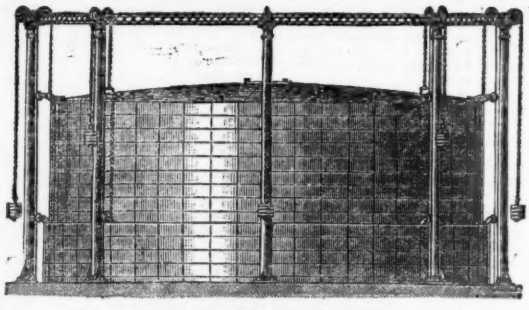

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ESTIMATES FOR GAS-WORKS OF ANY SIZE.
REFERENCES TO 500 WORKS ALREADY ERECTED.

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PLUTONIC CEMENT,

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AGENTS to THE GASLIGHT AND COKE COMPANY, LONDON, for the SALE of SULPHATE AMMONIA. Works: BECKTON.

CONTROL OF PRESSURE FROM GASHOLDER TO BURNER.

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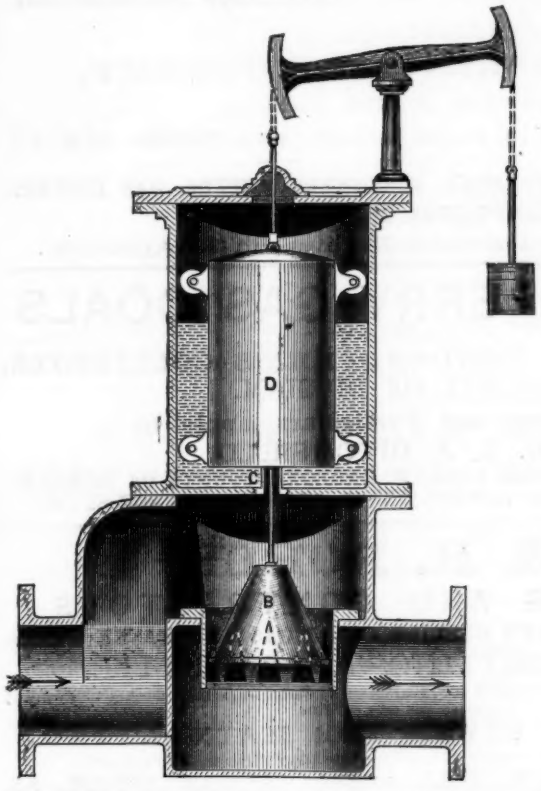
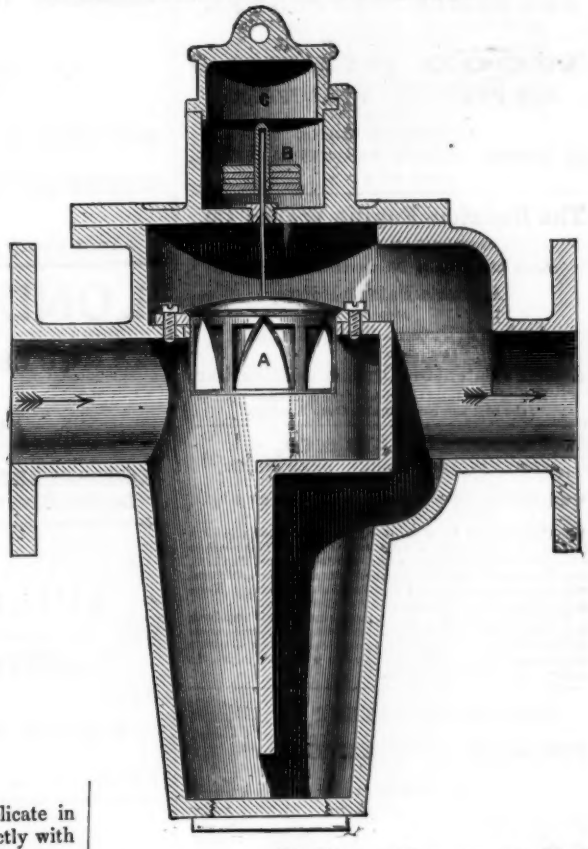
Respectfully call the attention of Gas Engineers to the following recent Improvements in Instruments employed for CONTROLLING PRESSURE from GASHOLDER to BURNER.

PEEBLES' PATENT SAFETY STATION GOVERNOR.



PEEBLES' PATENT DRY METALLIC DISTRICT GOVERNOR, with Self-Acting Syphon.



PATENT SAFETY STATION GOVERNOR, most delicate in its action, and free from pulsation. It may be controlled directly with weights, or at any distance by the Pneumatic system. It does not occupy above a third of the space required for ordinary Governors.

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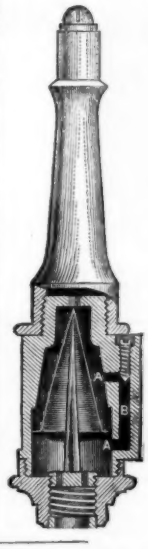
PATENT METALLIC NEEDLE GOVERNOR, for Public Lamps, with adjusting screw for regulating the consumption. This Governor is made of incorrodible materials. Many thousands of them are now in use, and giving every satisfaction.

PATENT METALLIC NEEDLE GOVERNOR BURNER, Made of a size suitable for ordinary use. It is not rated like the Lamp Governor, but is adjusted so that at pressures varying from about 8 to 30-tenths and upwards in the mains a steady flame is ensured. It should be used with globes having wide openings. Whenever there is a complaint as to the quality of the gas, Managers should put in these Burners.

N.B.—All the above Instruments, having been practically tested, are recommended with perfect confidence.



Dr. Robert Ferguson, President of the Royal Scottish Society of Arts, discussing the merits of the instrument, said:

"The Needle Governor is the *ne plus ultra* of a gas-burner. Mr. Peebles has produced the best governor that ever has been invented."

Dr. Stevenson Macadam, Professor of Chemistry, said:

"It is an admirable piece of apparatus, extremely simple, and has in my opinion revolutionized our idea of what a true and serviceable regulator of gas really is."

AGENTS FOR PATENT METALLIC NEEDLE GOVERNOR BURNER,

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The Dunston Engine Works Co.,
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Are the Sole Manufacturers of
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AND OF
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The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

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WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

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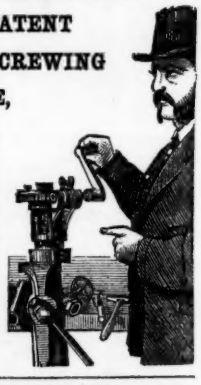

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.
In use at the chief gas-works, and giving great satisfaction.
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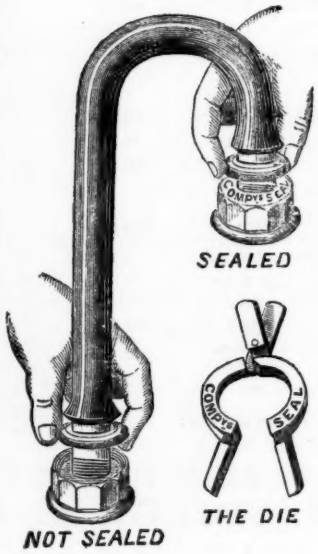
COUNTER-SUNK SEAL GAS-METER UNIONS,
As Supplied to The Gaslight and Coke Company.



These Unions practically place a Gas Company's property under lock and key, by rendering it impossible to disconnect at any joint at which gas could be obtained unregistered, without destroying the Company's seal or signature, whilst a small cover absolutely protects the impression from accidental injury.

A meter having been fixed with one of these Unions on the main-cock, and another on the inlet, a few pinches of specially prepared crushed sealing-wax is placed in the cup, and being melted with a blow-pipe, the wax runs between the reversed threads, the circular tong-shaped die will then give a sharp impression of the Gas Company's title, an operation requiring about two minutes in all to perform.

If heat is applied for the purpose of unsoldering the joints, the wax is instantly fused, and the impression, of course, lost.

Are supplied in all sizes, either as Caps and Linings or Barrel-Unions, and at a small additional cost over existing connections.

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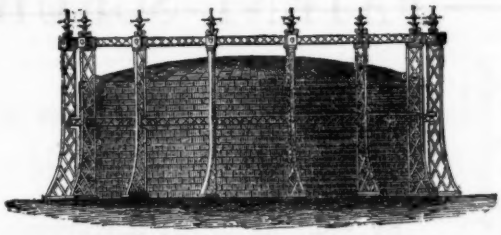

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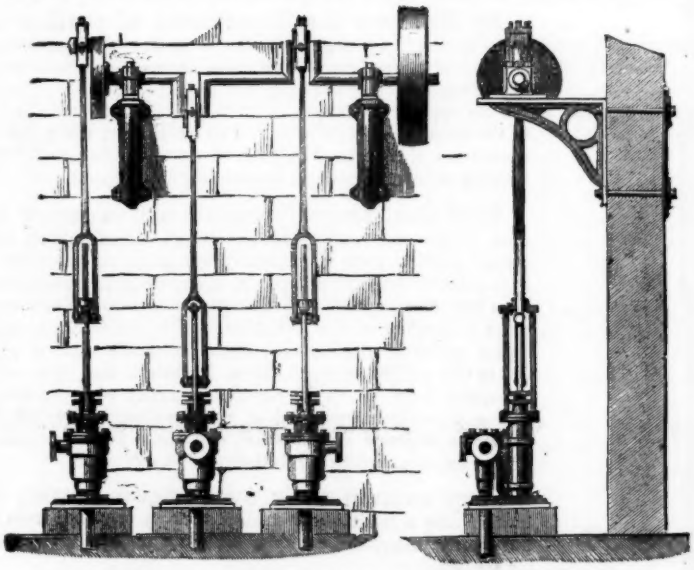

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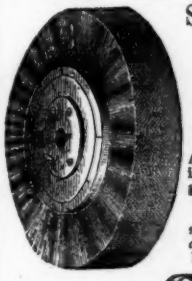

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,, 7,	,,		16	,,	7	,,	4	,, 90s. ,,
,, 8,	,,	upright,			7	,,	3	,, 48s. ,,
,, 9,	,,	12in. block,			7	,,	10	,, 180s. ,,
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Wheel,	6in.	dia.,	2¼	wide,	1½	wire	projects,	5	rows,	½ hole, each 10s.
,,	8	,,	2½	,,	1½	,,	,,	6	,,	,, ,, 18s.
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,,	18	,,	4	,,	3½	,,	,,	8	,,	1½ ,, 62s. 6d.

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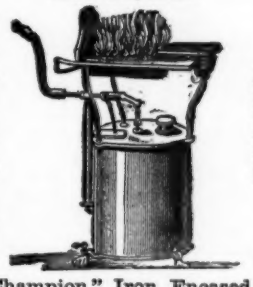
Are specially suited for General Out-door Purposes, and will be found suitable to any climate.



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With Vice-Drilling Frame on stand complete.

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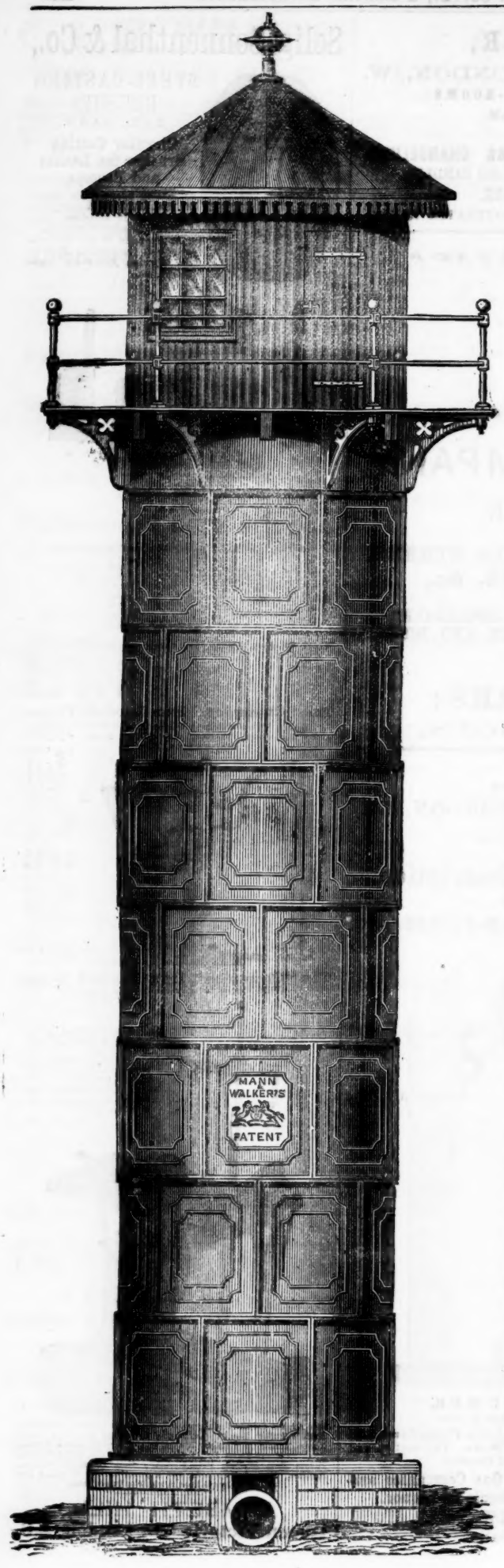

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It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

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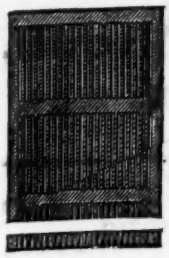

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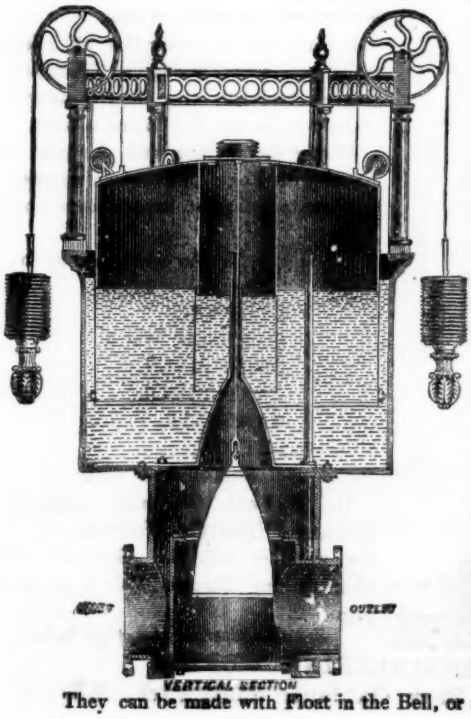
Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



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The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

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This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

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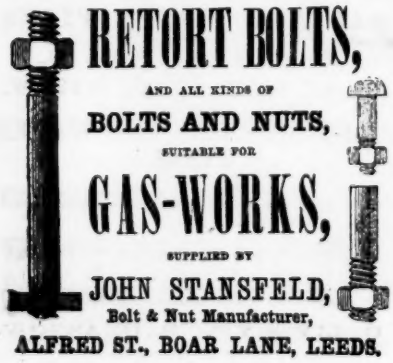

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Patent Compensating Steam Governor,

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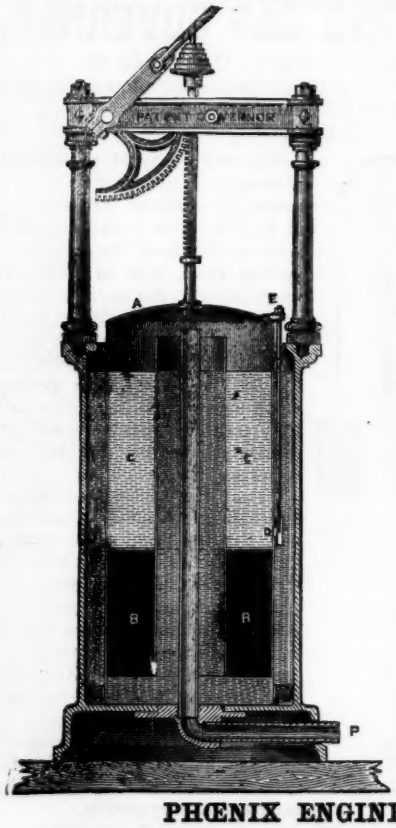

This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

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See also advertisement, page 518.

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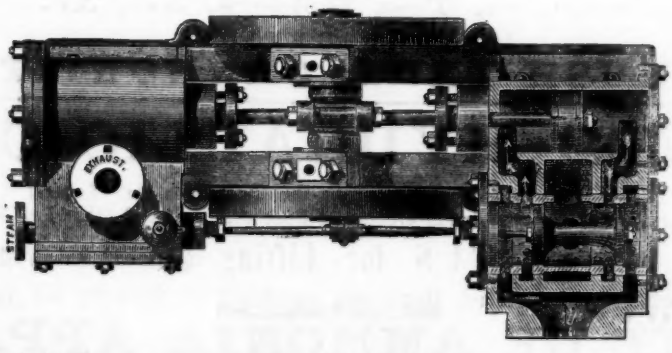

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